WATER AND RELATED LAND RESOURCES

WISCONSIN RIVER BASIN

WISCONSIN AND MICHIGAN

Prepared by

UNITED STATES DEPARTMENT OF AGRICULTURE

Economics, Statistics and Cooperatives Service

Forest Service

Soil Conservation Service

In cooperation with

Board of Soil and Water Conservation Districts

County Soil and Water Conservation Districts

APRIL 1979

USDA-SCS-LINCOLN, NEBR. 1979

REPORT ON

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WISCONSIN RIVER BASIN

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Objectives

The objectives of the Wisconsin River Basin cooperative study were to identify and appraise land, water, and related resource problems and needs, and to suggest potential solutions that can be implemented by the United States Department of Agriculture (USDA) and other Federal, State, and local agencies under existing authorities.

Data developed during the study will be useful to State and local governments, soil and water conservation districts, watershed associations, planning commissions, and other local groups. The Wisconsin Board of Soil and Water Conservation Districts and the local soil and water conservation districts will use the results of this study in developing their respective plans of work. This report provides information useful to both State and Federal agencies and officials in setting priorities for resource development projects.

The USDA will use the information as a basis for assisting State and local organizations in the development, conservation, and preservation of the Basin's resources. The information will also be directly useful to other programs and studies concerned with the Basin's land and water resources.

Authority

The USDA participated in this study under the authority of Section 6 of the Watershed Protection and Flood Prevention Act of the 83rd Congress (Public Law 566, as amended).

Description of the Basin

The Wisconsin River Basin lies in central Wisconsin. It drains approximately 12,000 square miles (31,080 square kilometers - sq km) or nearly 21 percent of the State. Its length is about 220 miles (350 km) in a north-south direction and 55 miles (90 km) wide in an east-west direction. See map following page 2.

The Wisconsin River rises near the Wisconsin-Michigan border at Lac Vieux Desert. It flows for about 430 miles (690 km) through the center of the State and empties into the Mississippi River south of Prairie du Chien.

About 96 percent of the Basin's land and water areas are in the State of Wisconsin and 4 percent in the State of Michigan. The land use of the 7,680,000 acres (3,108,000 hectares - ha) within the hydrologic boundary is shown in table 1-1.

In 1976, the Bureau of Census estimated that the population of the study area was about 516,000. The majority of the Basin residents were classified rural.

Table 1-1 Land Use
Wisconsin River Basin

	Acres	Percent of Basin
Cropland	2,250,000	29
Grassland	963,800	13
Forest land	3,233,300	42
Other	468,500	6
Urban	338,600	4
Water and noninventoried	425,800	6
TOTAL	7,680,000	100

The economy of the Basin is based on numerous activities. In 1975, the working force was employed as follows:

1. Agriculture and forestry ..... 12 percent
2. Construction ..... 3 percent
3. Manufacturing ..... 23 percent
4. Transportation and communication ..... 3 percent
5. Wholesale and retail ..... 17 percent
6. Other positions, mainly services ..... 42 percent

The largest single source of employment is the pulp and paper industry. Dairying and raising of livestock are the most important farm enterprises.

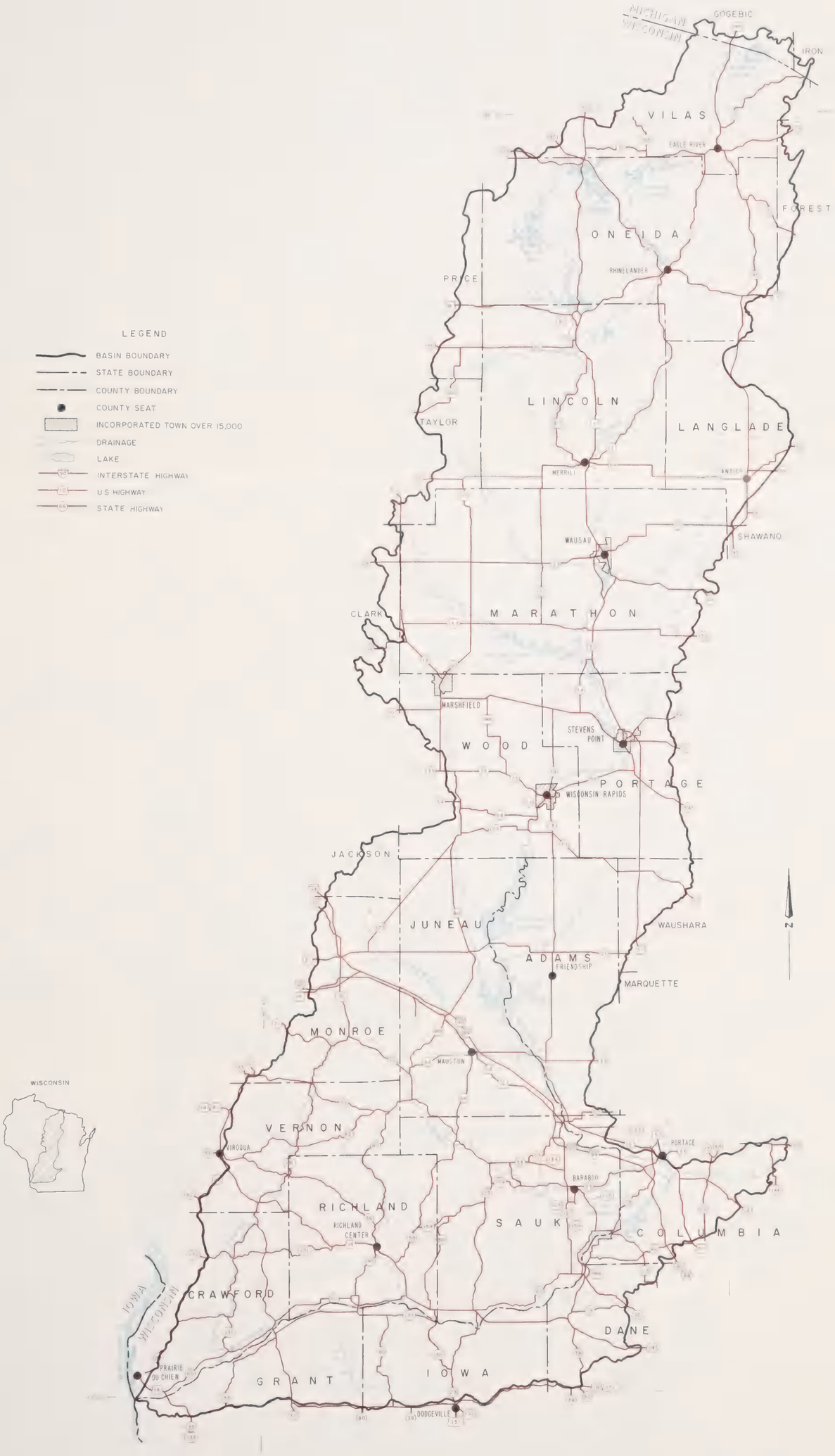
Problems and Concerns

Nearly 1,200,000 acres (485,600 ha) will require treatment measures to reduce erosion within soil loss tolerance 1/. Erosion rates are higher in the Driftless Area, Plan Area 3, and the southwest portion of Plan Area 2, because of intensified agriculture and steepness of topography. Therefore, this area has the greatest need for technical assistance.

The soil loss from sheet and rill erosion is about 16 million tons (14,515,000 tonnes) annually. The annual loss from cropland is about 8 million tons (7,257,000 tonnes). The annual erosion rate for cropland varies from 0.1 to 7.5 tons/acre (0.2 to 16.8 tonnes/ha) and averages about 3.5 tons/acre (7.8 tonnes/ha).

Forest grazing, a problem primarily in Plan Areas 2 and 3, is damaging understory and accelerating the rate of erosion. About 5 percent of the forest land

1/ Soil loss tolerance is the maximum rate of soil erosion that will permit a high level of crop productivity to be sustained economically and indefinitely.



WISCONSIN RIVER BASIN

WISCONSIN AND MICHIGAN

SOURCE
USGS 1/250,000 AND 15 MINUTE TOPOGRAPHIC QUADRANGLES AND INFORMATION FROM FIELD TECHNICIANS
TRANSVERSE MERCATOR PROJECTION

SCALE 0 5 10 15 20 25 30 35 MILES
0 5 10 15 20 25 30 35 40 45 50 55 60 KILOMETERS

Rev 2-7-79
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USDA-SCS-LINCOLN, NEBR. 1979

in Plan Area 2 and 32 percent in Plan Area 3 exceed soil loss tolerance. The highest average annual erosion rates ranging from 2.9 to 4.5 tons/acre (6.5 to 10.1 tonnes/ha) occur in Plan Area 3, notably in Crawford, Iowa, Richland, and Vernon Counties.

Over 6 percent of the Basin including about 76,400 acres (30,900 ha) of cropland, 75,100 acres (30,400 ha) of pasture and portions of 27 cities and 62 villages are periodically inundated by floodwater. Currently, the average annual floodwater damages are estimated at $3,511,000.

Evaluations of those areas identified with flooding problems by the public indicate that the cost of installing structural measures such as flood control dams, levees, etc., would exceed the benefits expected from floodwater reductions.

Basinwide, flood hazard data varies from none in some areas to detailed studies in others. It is limited in rural areas. About one-half of the cities and one-fourth of the villages have a detailed flood hazard study. A need exists for all flood hazard data to equal or exceed a common quality standard. Most cities, villages, and counties subject to flooding do not have flood plain management programs, building codes, or land use regulations based on detailed flood hazard studies and soils information.

A concern exists about the alteration of wildlife habitat, primarily because of encroachment on wetlands by land development and construction activities. While the rate of encroachment has slowed in recent years, about 6,800 acres (2,750 ha) of wetlands 1/ types 3-8 are expected to be lost to development by 2000.

The major recreational concern is resource protection and enhancement of existing facilities. The demand for outdoor recreational facilities in Plan Area 1 exceeds supply and it is expected to be compounded in the future because of the large number of users from outside the Basin and State. In Plan Area 2, some additional recreational opportunities will be needed to satisfy future demands. Implementation of the Lower Wisconsin Wild and Scenic River Study plan in Plan Area 3 will satisfy the public's expressed concern for additional access sites, island stopover areas, and adequate waste disposal facilities.

The National goals for surface water quality are expected to be met in the Wisconsin River principally through the elimination of major point sources of water pollution. The Wisconsin River, downstream from Castle Rock dam, meets the 1983 goals. Currently, many agencies and groups are cooperating in the effort to control nonpoint sources of water pollution.

1/ Shaw, Samuel P. and C. Gordon Fredine, 1956, Wetlands of the United States. Fish and Wildlife Circular 39, 67 p.

Changes in population or industrial growth are not expected to have any significant impact on the 2,077,000 acres (840,600 ha) of prime farmland. However, some small acreages near or on the periphery of urban areas are expected to be converted to nonagricultural land uses.

Alternative Plans

Eight alternatives to solve problems or satisfy needs were evaluated through the year 2000. Essentially, each alternative reflects various levels of agricultural tillage and management practices. Two of the alternatives emphasized economic development, five utilized various levels of land treatment to emphasize environmental quality, and one was the continuation of present trends. A ninth alternative was formulated to evaluate the impact of removing prime agricultural land from production. Any alternative or its component parts could be implemented with existing Federal and/or State authorities.

CHAPTER II - INTRODUCTION

CHAPTER II - INTRODUCTION

This report was prepared by the United States Department of Agriculture (USDA) and the State and local sponsoring agencies and organizations. It appraises the availability of land, water, and related resources to meet present and future needs. Alternative opportunities to reduce flood damage, soil erosion, and sedimentation, and to provide wildlife habitat were appraised. Environmental quality, outdoor recreation, and agricultural water management were also evaluated. These appraisals and opportunities for development through USDA programs were evaluated in physical, economic, and environmental terms.

Authority for this study is Section 6 of the Watershed Protection and Flood Prevention Act, as amended (Public Law 83-566 enacted in August 1954). This cooperative river basin study was authorized for investigations and studies by the Administrator of the Soil Conservation Service on August 23, 1973.

The study was requested by the Wisconsin Board of Soil and Water Conservation Districts. The Board expressed a need to coordinate USDA programs with those of other Federal and State agencies to arrive at an overall plan for solving the water and related land resource problems for the study areas.

OBJECTIVES

Objectives of the study were to identify and appraise the land, water, and related resource problems and needs, and to suggest potential solutions and implementation opportunities.

PARTICIPATING UNITED STATES DEPARTMENT OF AGRICULTURE AGENCIES

USDA participation was in accordance with a Memorandum of Understanding between the Economics, Statistics, and Cooperatives Service (ESCS); Forest Service (FS); and Soil Conservation Service (SCS), dated February 2, 1956, and revised April 15, 1968.

The study was carried out under the general guidance of a USDA Field Advisory Committee (FAC), composed of a representative from the SCS, ESCS, and FS. The SCS provided leadership in carrying out the USDA responsibilities in the study. The personnel assigned by the three agencies to the Wisconsin River Basin study functioned as a team under the guidance of the FAC. Each agency had responsibility for certain aspects of the study as outlined in a plan of work approved by the FAC. The FAC met at regular intervals to review planning procedures and progress of the study. Meetings were held with the sponsors to discuss progress and to determine sponsor objectives concerning the scope of the study.

SPONSORING AND COOPERATING AGENCIES

The study was sponsored by the Wisconsin Board of Soil and Water Conservation Districts and the county soil and water conservation districts. In addition to the sponsors, other agencies contributing to the study, included the State Departments of Administration; Agriculture, Trade and Consumer Protection; Health and Social Services; Justice; Natural Resources; and Transportation. Other cooperating agencies included the Upper Mississippi River Basin Commission, and the University of Wisconsin; Extension, the Geological and Natural History Survey, and the Water Resources Center. Federal agencies that aided in the study included the Department of Defense, Army Corps of Engineers; the Department of the Interior, Fish and Wildlife Service, and the Geological Survey; and the Environmental Protection Agency. Regional planning commissions also contributed to the study. These included the North Central Wisconsin Regional Planning Commission, the Mississippi River Regional Planning Commission, the Southwestern Wisconsin Regional Planning Commission, the Dane County Regional Planning Commission, and the Portage County Areawide Planning Commission. Other State and local groups in Wisconsin provided data and assistance during the study. Significant contributions were obtained from private individuals and business firms such as the Wisconsin Valley Improvement Company.

HOW THE STUDY WAS MADE

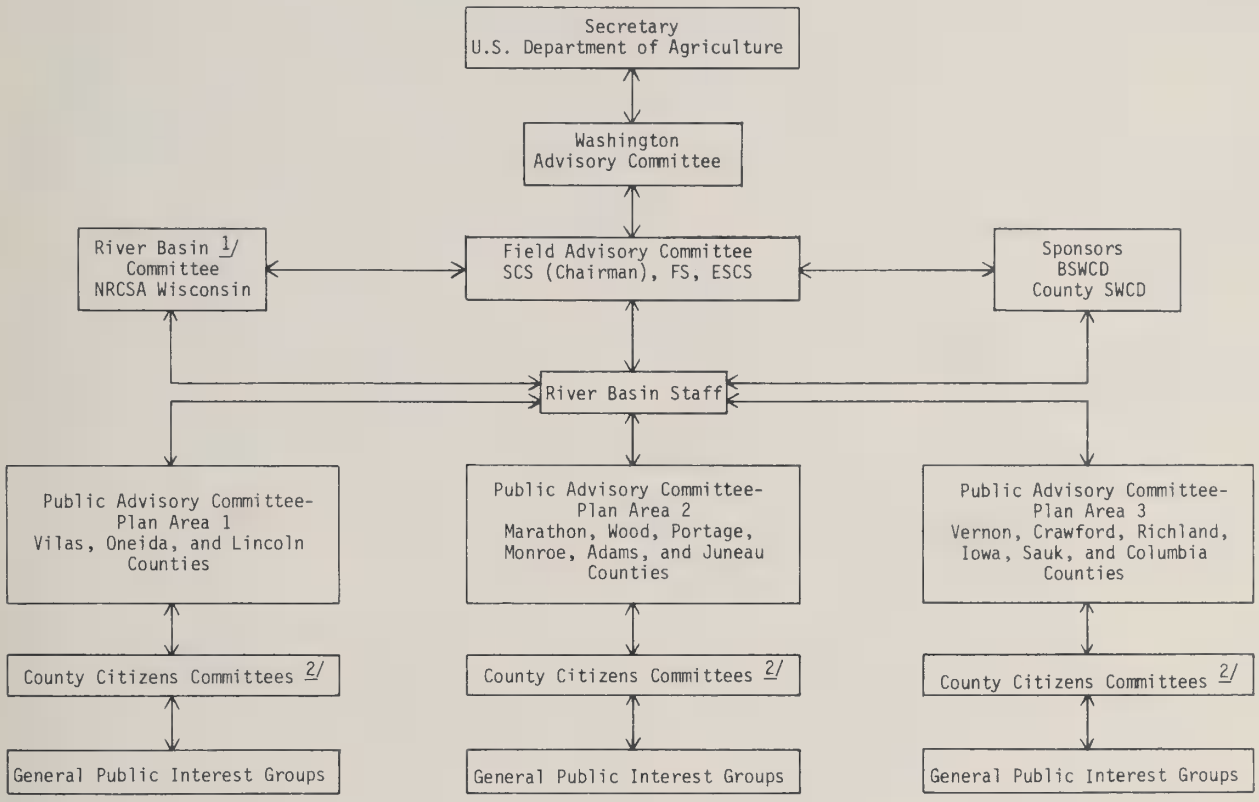
The USDA River Basin staff utilized available published and unpublished data and developed additional basic data needed for the study. The 1967 USDA Conservation Needs Inventory (CNI) served as a basis for a portion of the land use and soils data. This was supplemented with updated CNI data and information from the Census of Agriculture, the Wisconsin Statistical Reporting Service, farmer interviews, soil conservation district supervisors, county foresters, and SCS personnel.

Prior to making projections of future activity, past and present trend variables such as farm size, farm numbers, and agricultural production were analyzed. Benchmark projections for the year 2000 were developed under the assumptions that agricultural drainage, irrigation, and flood prevention were not expanded or improved at accelerated rates. A further analysis evaluated the economic potential for resource development and provided projected land use based upon the incorporation of land treatment, agricultural drainage, and flood prevention measures. Expected production levels were utilized to project agricultural population; employment; value of production; location of production; and rural domestic, and livestock water requirements. The impact of production changes upon the agriculturally-related sector of the economy was also identified.

Information was gathered and supplemented by field investigations on public and private forest lands. Data on forest resources, economic impact, hydrologic impact, growth and yield, recreation and wildlife use, and land treatment and management needs were collected and analyzed.

All land and water resource problems designated by public participants were considered. The "public" is broadly defined as any individual, group or organization not sponsoring or funded to make the study. The public had a role in determining priorities, solutions, and alternatives.

GENERAL ORGANIZATION AND PUBLIC INVOLVEMENT
WISCONSIN RIVER BASIN COOPERATIVE STUDY



1/ The statute creating the NRCSA was repealed by Wisconsin Sentate Bill 77 of June 29, 1977.

2/ Citizens Committees were organized through the County SWCD with the assistance of the SCS District Conservationist. The number of general public interest groups was not limited. Federal, State, and local agencies were available for consultation.

USES OF THE REPORT

Information presented in this report will be useful to State government, local governments, soil and water conservation districts, watershed associations, planning commissions, and other local groups. It can be an aid in planning land use; developing budgets and setting priorities for expenditures of funds; and early acquisition of needed improvements. The information may be useful in the development of State and local land use regulations. The Wisconsin Board of Soil and Water Conservation Districts and the local soil and water conservation districts will use the results of this study in developing their respective plans of work.

The report will be helpful in long range planning by the State of Wisconsin for parks, fish and wildlife developments, water resource studies, agricultural and forestry programs, scenic river development, and other natural resource studies. The report provides recommendations and information useful to both State and Federal agencies and officials in setting priorities for resource development projects. The USDA will use the report as the basis for directing its efforts in cooperation with soil and water conservation districts, watershed groups, and other resource-related groups. The information will also be directly useful to other programs and studies concerned with the Basin's land and water resources. For example, the programs concerned with nonpoint pollution in this study will provide information on the severity and general location of excessive rates of erosion including the types, the amounts, and the effects of land treatment measures and/or management.

Information about soil use suitability, floodwater damages, and water and related land resources can assist land developers and industrial interests in selecting suitable development sites.

The basic data collected and used in this study, including the reference reports are on file at the State Office of the Soil Conservation Service, 4601 Hammersley Road, Madison, Wisconsin 53711.

CHAPTER III
PROBLEMS, CONCERNS AND PROJECTED CONDITIONS

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PROBLEMS, CONCERNS, AND PROJECTED CONDITIONS

The problems and concerns expressed by the public are the basis for this report. The public identified 138 items of concern within the Basin. About one-third of these concerns (problems) were pertinent to water and land management. Other problems cited were relative to pollution, erosion, sedimentation, and social well-being. Some of the concerns were within the scope of the study objectives. Alternative solutions were developed and evaluated for these concerns. Most of the concerns are the responsibility of other agencies and required major input by them in order to be evaluated. Some were resolved during the study and some are being resolved by ongoing local, State, and Federal programs. The remaining items were beyond the scope of the study and were not evaluated.

Solutions to the problems were evaluated in terms of their impact upon economic growth, increased production efficiency, and general enhancement of the physical environment. Table 3-1 lists the concerns studied. The difference in magnitude between the current and year 2000 time periods is due to the continuation of present trends and ongoing programs and projects.

Table 3-1 Problems and Concerns Evaluated
Wisconsin River Basin

Concern	Unit	Time period 1977	Time period 2,000
Agricultural Income from Major Crops	Dollars	180,462,000	248,845,000
Forestry Production	Million Cubic Feet	75.8	131.2
Erosion damage			
Area Needing Treatment	Acres	1,197,300	1,043,600
Rate	Av. Ann. Tons	16,000,000	14,000,000
Floodwater Damages	Dollars	3,511,000	5,949,000
Cropland-wet soils	Acres	183,000	156,000
Wetlands-loss	Acres	698,200	691,400
River Mile Locations Standard Base	No.	7	1
Lake Outlets Needed	No.	4	0
Recreation (Launch Sites Needed)	No.	379	14

AGRICULTURAL PRODUCTION

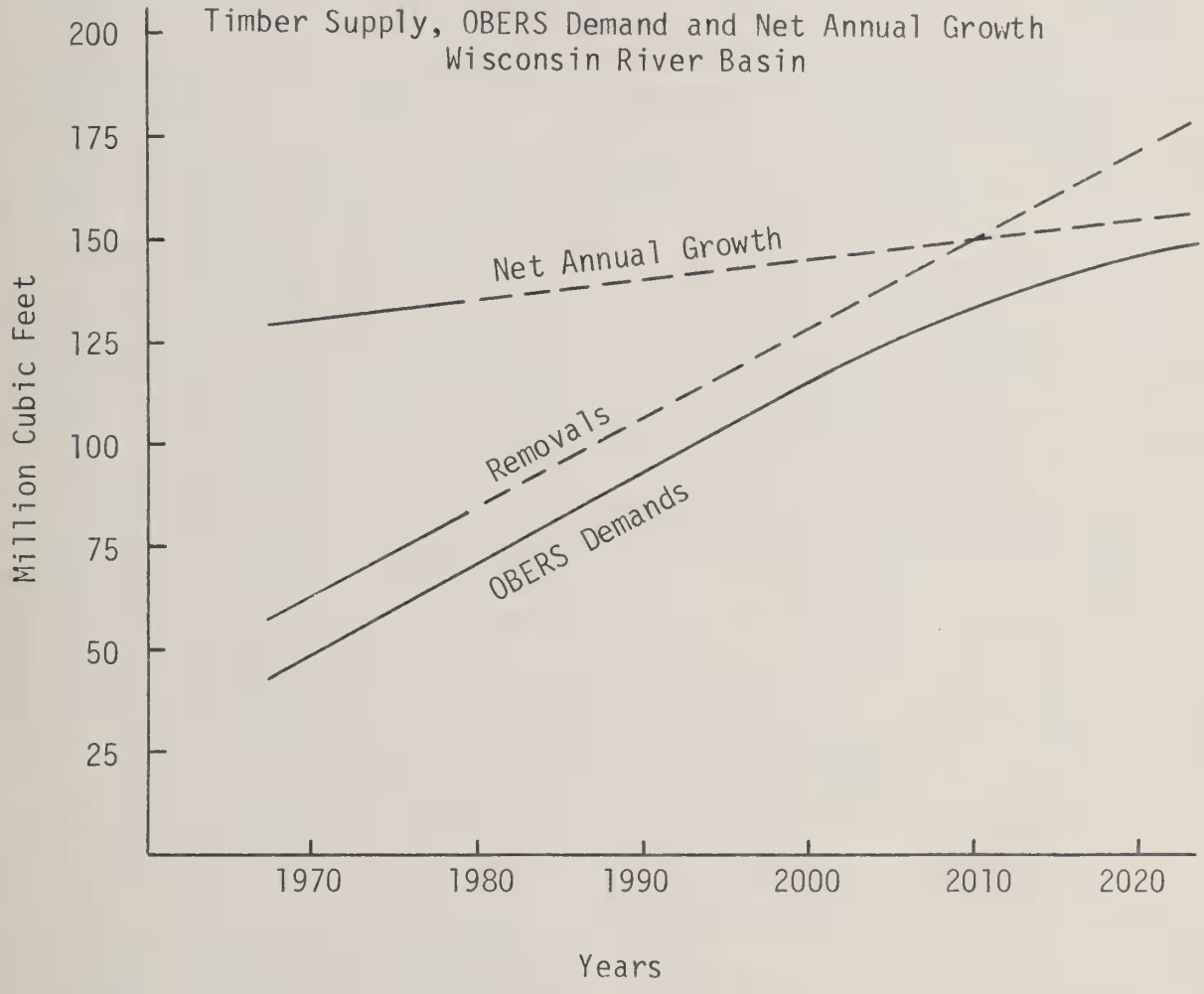
An economic development objective to increase income from crop production was identified. The level of agricultural production projected in year 2000 is presented in table 3-2. These projections are based on the continuation of present trends and existing programs at present levels. They are based upon an assumption of relatively stable proportions of crop production by plan area, and roughage production based upon projected livestock production. Production of most crops is projected to increase while the actual acreages are expected to decrease. This occurs because the crop yields are continually increasing. Increasing yields and some shifting of crops to more productive soils combine to increase the acreage of idle cropland. The return to production of major crops is projected to increase 37 percent by the year 2000 as shown in table 3-1. This includes increases from the production of corn, silage, oats, and cropland pasture along with decreases in the return from hay and permanent pasture production.

FORESTRY PRODUCTION

An adequate supply of wood products was an expressed concern. This concern may be valid in some localized areas. However, a comparison of projected removals with OBERS projected demands shows the timber industry providing about 14 percent more fiber than the OBERS (Bureau of Economic Analysis [formerly OBE] and the Economics, Statistics, and Cooperatives Service [formerly ERS]), requirements through the year 2000. Most of this demand is being met from the forests in Plan Areas 1 and 2.

Pulpwood Stockpile, Plan Area 2

The curves shown in the following graph compare OBERS demands, removals, and net annual growth. These projections are gross indications of what might be expected. Although OBERS demands are satisfied through the year 2000 and beyond without overcutting, a problem could develop about 2010 when removals might exceed net annual growth. If this situation develops, it will be a regional problem and the seriousness of the potential shortage in timber growth should be reexamined periodically. If an overcutting problem develops, the net annual growth/removal relationship can be adjusted by intensifying silvicultural practices on the more productive lands, planting trees on the better idle land, or reducing cutting levels.



EROSION

By general definition, erosion is the detachment and movement of rock, soil, and subsoil particles or masses by wind, water, ice, and gravity. Culturally accelerated erosion includes sheet and rill erosion, gully erosion, streambank and shoreline erosion, wind erosion, and erosion occurring on roadsides and developing urban areas.

Table 3-2

Crop Production, Current and 2000
Wisconsin River Basin

	Unit	Current 1/ Plan Area 1	2	3	Basin	2000 2/ Plan Area 1	2	3	Basin
		1000 units							
Corn Gr.	Bu.	17.0	8,121.0	25,342.6	33,480.6	27.0	12,919.3	40,333.2	53,279.5
Corn Silage 3/	Ton	34.5	909.0	978.9	1,922.4	46.6	1,081.0	1,119.8	2,247.4
Oats 3/	Bu.	768.7	6,758.5	6,070.3	13,597.5	946.4	12,235.4	11,178.3	24,360.1
Hay 3/	Ton	71.3	956.8	1,282.0	2,310.1	50.8	645.2	718.2	1,414.2
Pasture 4/	Ton	140.5	1,035.8	1,341.5	2,517.8	65.6	878.1	1,059.3	2,003.0
Wheat	Bu.	4.3	67.7	119.1	191.2	1.3	20.6	36.3	58.3
Barley	Bu.	9.4	36.1	22.1	67.6	0.8	3.5	2.2	6.5
Rye	Bu.	3.1	49.3	9.2	61.6	0.9	14.8	2.9	18.5
Soybeans	Bu.	--	155.4	295.0	450.4	--	389.2	739.0	1,128.2
Vegetables	CWT	--	1,185.9	2,680.0	3,865.9	--	1,414.3	3,146.9	4,561.2
Potatoes	CWT	998.9	5,374.6	423.1	6,796.6	1,218.4	6,956.8	522.2	8,697.4
Fruit	Ton	4.1	18.3	11.0	33.4	3.9	17.4	10.3	31.5
Tobacco	Lbs.	--	516.8	9,635.9	10,152.7	--	219.4	4,149.8	4,369.2

1/ Figures are 1973, 1974, and 1975 average from Wisconsin Statistical Reporting Service publications entitled, "Wisconsin Agricultural Statistics".

2/ Projections are 1972 OBERS E' except for silage, hay, and pasture.

3/ Production for 2000 based on roughage required for livestock.

4/ Calculation same as 3/. This includes both cropland pasture and permanent pasture.

Accelerated erosion and other hazards to crop production are a serious problem on some soils. The capability grouping of Basin soils is designated by Roman numerals I through VIII. Classes I through IV soils are the most commonly cultivated. Class I soils are those with few limitations that restrict their use. As the numerals increase, limitations are more restrictive as to the choice of plants and dictate more intensive conservation practices. Classes V through VIII soils are generally not suited for cropping because of miscellaneous hazards such as flooding, topographic configuration, rock outcrops, and thin soil profile. These soils are suitable for pasture, woodland, or wildlife area.

In the soil capability grouping, specific soil hazards or limitations are identified by adding a lower case letter to the capability class. These hazards and limitations are erosion (e); drouthiness, stoniness, or steepness of slope (s); or excessive water (w). Table 3-3 shows the percent distribution of soils and their hazards by plan areas.

Lasting accelerated erosion is more pronounced on lands continuously used for agriculture than on lands in other uses. Lands undergoing urban expansion without erosion control are generally eroded during the construction period at rates many times that of cropland. Table 3-4 shows the distribution of erosive (e) soils by plan area and land use. Overgrazing of lands also increases soil erosion through reduction of the vegetative cover. Erosion by water averages over 16 million tons (14.5 million tonnes) annually. Cultivation of sandy soil areas has also accelerated the movement of soil by wind. Erosion from wind also results in removal of varying thicknesses of soil as the most exposed areas have higher rates of soil movement than the more protected areas.

Table 3-3 Soils and Hazards Distribution
Wisconsin River Basin

Plan Area	Class I Soils	Class II through VIII e Soils (Erosive)	Class II through VIII s Soils (Steep, Stony, Drouthy	Class II through VIII w Soils (Wetness, Flooding)
	Percent			
1	0.1	47.0	21.9	31.0
2	0.6	41.0	28.4	30.0
3	1.0	67.0	20.0	12.0

Sheet and Rill Erosion

All land is subject to sheet and rill erosion. About 7.2 million acres (2.9 million ha) of the total land area has soil losses within soil loss tolerances. The soil loss from sheet and rill erosion is 16 million tons (14.5 million

Table 3-4 Distribution of Erosive (e) Soils
Wisconsin River Basin

Plan Area	Percent of Erosive Soils	Cropland	Pasture	Forest	Other Land
		----------Acres----------			
1	47%	76,400	52,600	691,300	40,900
2	41%	657,000	214,100	449,100	90,700
3	67%	918,400	366,800	458,900	107,600
TOTAL	51%	1,651,800	633,500	1,599,300	239,200

Source: 1976 CNI update.

Table 3-5 Area Exceeding Soil Loss Tolerance Levels 1/
(Sheet and Rill Erosion)
Wisconsin River Basin

	Land Needing Treatment	
	Current	2000
	----------Acres----------	
Plan Area 1	23,800	23,500
Plan Area 2	320,400	270,900
Plan Area 3	853,100	749,700
Basin	1,197,300	1,044,100

1/ Soil Loss Tolerance is the maximum rate of soil erosion that will permit a high level of crop productivity to be sustained economically and indefinitely.

tonnes) annually, averaging 1.9 tons per acre (4.3 tonnes per ha) for all land. This is expected to be reduced to 14 million tons (12.7 million tonnes) by 2000. Nearly 1.2 million acres (0.5 million ha) still require treatment measures to reduce erosion to within soil loss tolerance. By 2000, the on-going program will reduce total acres needing treatment to 1 million acres (0.4 million ha) table 3-5. Table 3-6 entitled, "Status of Land Treatment", on page 15, and the "Land Quality Assessment Map", following page 18, show the percent of Basin and plan areas that are adequately protected and land needing treatment.

Table 3-6

Current Status of Land Treatment
(Sheet and Rill Erosion)
Wisconsin River Basin

Land Use	Adequately Protected	Land Needing Treatment (Erosion on Land Exceeding Soil Loss Tolerance)		
		Less Than 6 T/Ac/Yr	Exceeding 6 T/Ac/Yr	Total
	Percent			
Plan Area 1				
Cropland	93.0	6.6	0.4	7.0
Woodland	99.8	0.18	0.02	0.2
Grassland	90.0	4.0	6.0	10.0
Other	98.0	0.6	1.4	2.0
Total Area	98.8	0.7	0.5	1.2
Plan Area 2				
Cropland	85	8	7	15
Woodland	95	2	3	5
Grassland	87	3	10	13
Other	96	1	3	4
Total Area	91	4	5	9
Plan Area 3				
Cropland	64	12	24	36
Woodland	68	9	23	32
Grassland	79	10	11	21
Other	89	5	6	11
Total Area	70	10	20	30
Basin				
Cropland	75	10	15	25
Woodland	91	3	6	9
Grassland	83	6	11	17
Other	96	1	3	4
Total Area	86	5	9	14

Table 3-7

Sheet and Rill Erosion Rates
Wisconsin River Basin

County	Cropland	Woodland	Grassland	Other Land	Urban Land	All Land
	Average Tons Per Acre Per Year					
Lincoln	1.0	0.2	1.3	0.6	1.0	0.5
Oneida	1.2	trace 1/	0.1	0.1	1.1	0.1
Vilas	0.1	trace 1/	trace 1/	0.1	1.2	0.1
Plan Area 1	1.0	0.1	1.0	0.2	1.1	0.2
Adams	1.8	0.2	0.2	3.8	trace 1/	0.6
Juneau	4.3	1.0	0.9	1.3	trace 1/	1.7
Marathon	1.9	0.7	1.4	1.0	0.5	1.4
Monroe	4.2	1.7	4.0	3.3	0.3	3.4
Portage	1.2	0.1	0.2	1.4	0.6	0.5
Wood	1.8	trace 1/	0.1	0.6	0.1	0.6
Plan Area 2	2.3	0.7	1.6	2.0	0.3	1.4
Columbia	3.1	0.5	0.5	3.4	1.4	2.3
Crawford	7.5	2.9	4.2	3.2	3.1	4.5
Iowa	4.1	3.8	2.1	1.9	2.7	3.5
Richland	6.8	4.5	4.0	3.0	3.2	5.0
Sauk	5.6	2.4	2.3	3.5	4.6	3.9
Vernon	3.9	3.9	2.4	4.4	2.9	3.7
Plan Area 3	4.7	3.1	2.7	3.3	3.0	3.7
Basin 2/	3.5	1.0	2.1	1.4	1.3	1.9

1/ Trace - less than five hundreths of a ton per acre per year
2/ Basin areas are economic plan areas and not hydrologic areas

SOURCE: 1976 Update Conservation Needs Inventory Data

Cropland, because of intense cultivation, is more susceptible to sheet and rill erosion. The annual soil losses of all cropland amounts to over 8 million tons (7.3 million tonnes) and averages about 3.5 tons per acre (7.8 tonnes per ha). By 2000, the annual soil losses from cropland are expected to be reduced to 7 million tons (6,350,000 tonnes).

Erosion rates in Plan Area 3 and southwestern portion of Plan Area 2 are higher because of intensified agriculture and the steepness in topography. Average annual sheet and rill erosion rates for the various land uses are shown in table 3-7 by county, plan area, and for the Basin. Plan Area 1 has the least soil erosion problems because 71 percent of this area is forested and agricultural practices are much less intensified.

Forest grazing will continue to be a problem in Plan Areas 2 and 3. The grazing level is 19 percent in Plan Area 2 and 50 percent in Plan Area 3 as compared to 2 percent in Plan Area 1. Erosion and sedimentation caused by the high levels of grazing in Plan Areas 2 and 3 are detrimental to the forest ecosystem. Table 3-8 summarizes forest grazing.

Table 3-8 Forest Grazing
Wisconsin River Basin

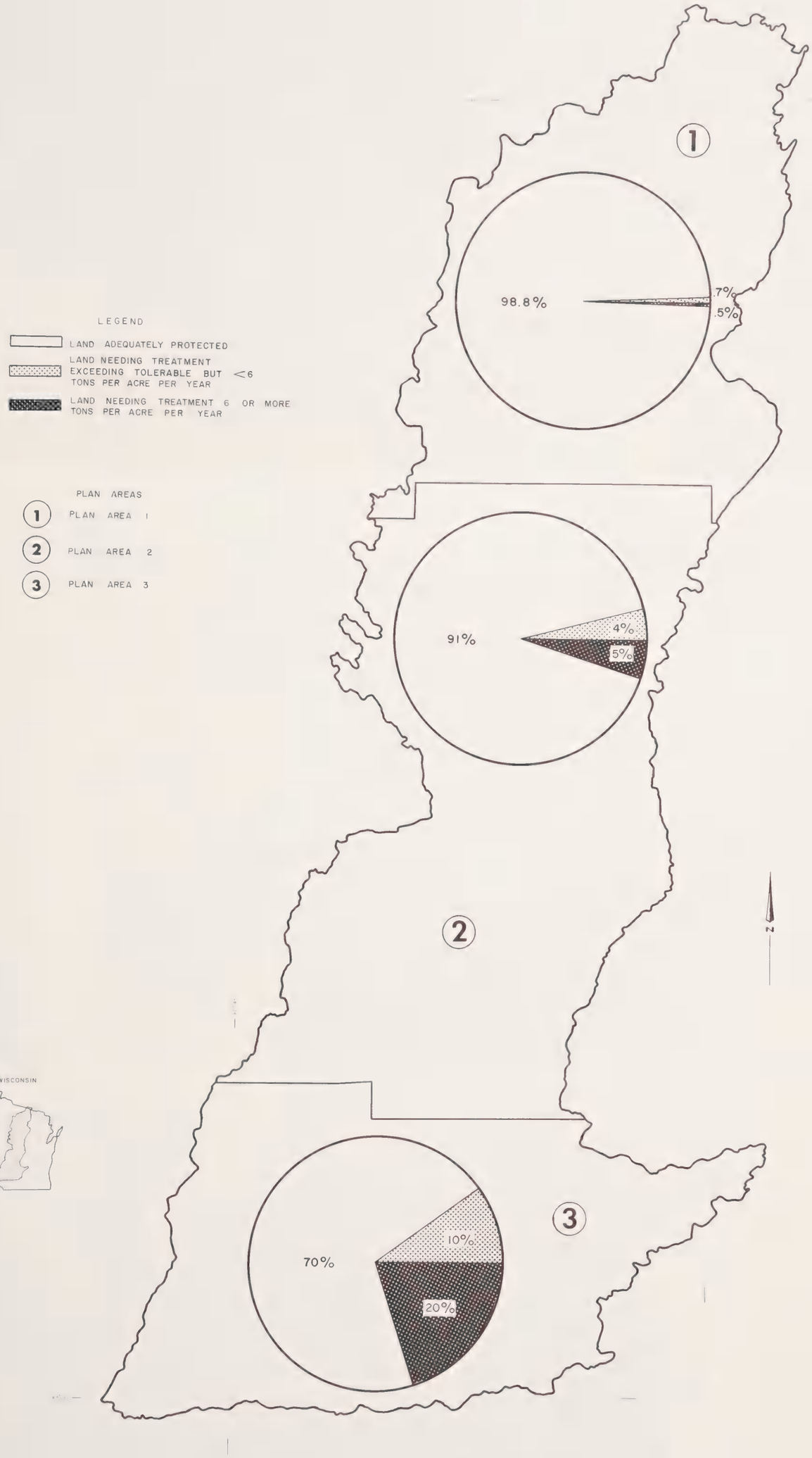
	Current	2000[1/]
	----------Acres----------	
Plan Area 1	31,800	30,700
Plan Area 2	271,400	261,400
Plan Area 3	358,700	346,200
Basin	661,900	638,800

1/ Decrease due to overall reduction in forest acreage

Gully Erosion

Gullying is the erosion of soils, subsoils, and poorly consolidated or "soft" bedrock by concentrated flows of water on uplands and valley slopes. Waterflow concentrates and forms a relatively narrow and deep channel which enlarges by rapid headward and lateral erosion and downcutting. The land annually voided by gully erosion is about 644 acres (265 ha).

Gully Erosion -- A Pasture in Richland County, Plan Area 3



LAND QUALITY ASSESSMENT
SHEET AND RILL EROSION
WISCONSIN RIVER BASIN
WISCONSIN AND MICHIGAN

1/1,000,000

SCALE 5 0 5 10 15 20 MILES

SOURCE:
FAMILY OF MAPS SCS DRWG. NO. 5, R-32,569.2 (6-74)
AND INFORMATION FROM FIELD TECHNICIANS
TRANSVERSE MERCATOR PROJECTION

6-15-78
5,0-36,961

USDA-SCS-LINCOLN, NEBR. 1978

Streambank Erosion

Streambank erosion is the removal of material from channel banks by flowing water and the caving of streambanks. It may cause damage to bridges, buildings, roads, highways, and fish and wildlife habitat.

Over 1,100 miles (1,770 km) of bank erosion of perennial streams exists in the Basin. See table 3-9 for details.

Streambank erosion depends on many factors, such as rainfall frequency and intensity, height of bank, bank materials, vegetation, velocity of flow, and freezing and thawing. Certain combinations of these variables produce conspicuous and sometimes spectacular bank removal. A good example is near the confluence of the Pine River and the Wisconsin River, Richland County.

Streambank Erosion, Livestock Induced, Monroe County, Plan Area 2

A major concern associated with streambank erosion and shoaling, fishery deterioration, and potential safety hazards to river users, was the rapidly changing water levels below the Prairie du Sac hydroelectric dam. Recognizing that this concern was beyond the scope of this study, the Plan Area 3 Advisory Group arranged for several meetings between the citizen groups and power company officials to discuss and explore possibilities for alleviating the water fluctuation problem. As a result of these meetings the power company moderates releases whenever possible, and concerned citizens become aware of problems associated with power generation.

Table 3-9 Streambank Erosion, Perennial Streams
Wisconsin River

County	Estimated Linear Miles of Bank Erosion
Vilas	4
Oneida	6
Lincoln	1
Plan Area 1	11
Marathon	170
Wood	14
Portage	37
Monroe	57
Juneau	17
Adams	5
Plan Area 2	300
Vernon	38
Crawford	60
Richland	284
Sauk	76
Columbia	13
Iowa	360
Plan Area 3	831
Basin	1,142

Wind Erosion

Wind erosion is the detachment and transportation of mineral and/or organic soil particles by the wind. Windbreaks, comprised of trees and shrubs, have helped to reduce wind erosion.

The public expressed a concern about the removal of windbreaks to accommodate pivot type irrigation systems. Studies indicate that the amount of windbreaks has decreased from 614 miles (988 km) in 1969 to 512 miles (824 km) in 1977, and is expected to decrease to 456 miles (734 km) by 2000. About 60 percent of the windbreaks were removed to accommodate the irrigation systems. Currently, alternative means such as use of various perennial grasses, trees, and shrubs are being evaluated for protection from wind erosion, notably in Adams County.

Roadside Erosion

Roadside erosion is the abstraction by water of soil material from the embankment and an artificial cut adjacent to a road. It principally occurs as a sheet and rill process, sometimes accompanied by mud slides, incised channeling of runoff, and the development of small gullies.

At the beginning of the study, roadside erosion was identified as a widespread but not serious problem. Since then the problem has been adequately taken care of by individual counties and/or by resource conservation and development project measures.

Erosion in Urban and Developing Areas

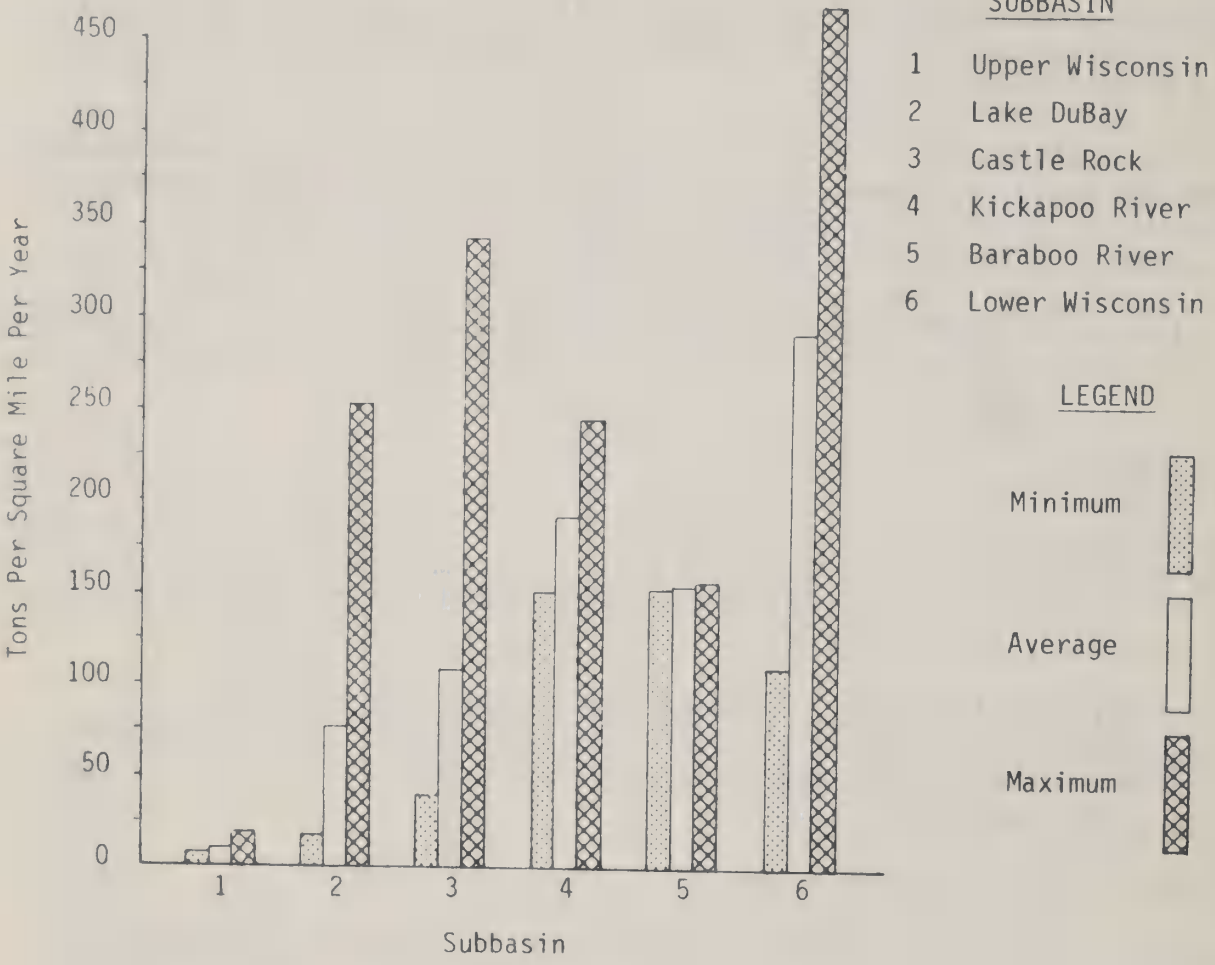
This type of erosion is predominantly sheet and rill erosion from developing areas. Erosion caused by development was considered to be minor because of the small amount of urbanization projected for the Basin.

SEDIMENT DAMAGES

The public expressed some concern about sediment filling of swamps, bogs, lakes, flowages, streams, and rivers. However, Lake Tomah in Plan Area 2 was the only area specifically identified. Lake Tomah is filling rapidly because of a large drainage area to impoundment volume ratio, rather than a high sediment yield rate. Overall, the sediment yield rate for the Basin is low, ranging from less than 0.01 to 0.30 acre feet per square mile (5 to 143 cu m/sq km) annually. The effects of sediment damages were not addressed in the study. See table 3-10, Sediment Yield Data, on page 22, and the Sediment Yield Map following page 22 for details.

Table 3-10

Sediment Yield Rates
Wisconsin River Basin

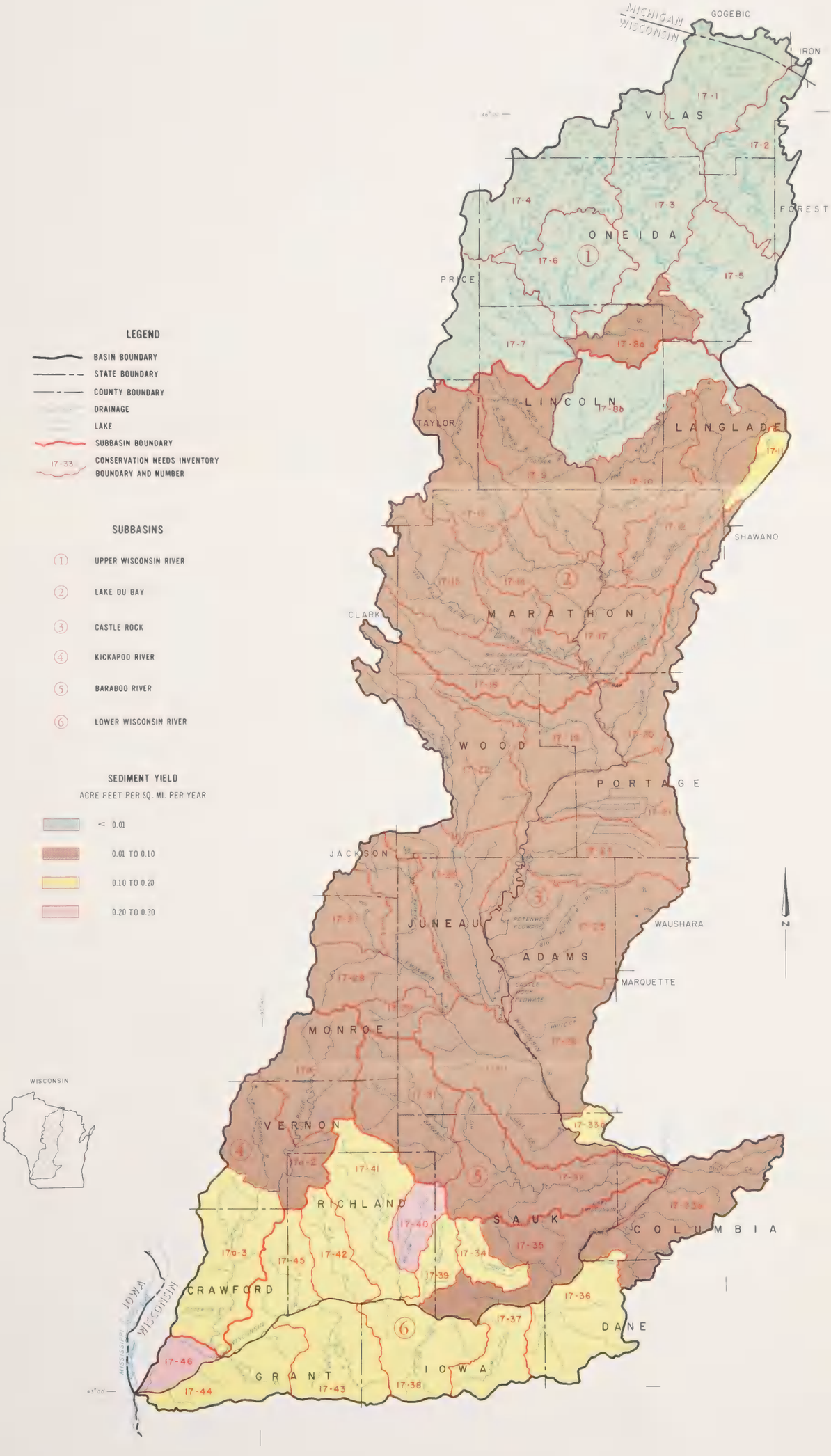


FLOODWATER DAMAGES

An estimated 486,300 acres (196,800 ha), or 6.35 percent of the Basin is periodically inundated by floodwater. About 76,400 acres (30,900 ha) of cropland; 75,200 acres (30,400 ha) of pasture and portions of 27 cities and 62 villages are on the flood plain, table 3-11.

Flooding is one of the primary concerns in Plan Areas 2 and 3. It is of much less concern in Plan Area 1. Currently, average annual floodwater damages are estimated at $3,511,000, table 3-12.

U S DEPARTMENT OF AGRICULTURE



LEGEND

- BASIN BOUNDARY
- STATE BOUNDARY
- COUNTY BOUNDARY
- DRAINAGE
- LAKE
- SUBBASIN BOUNDARY
- 17-33 CONSERVATION NEEDS INVENTORY BOUNDARY AND NUMBER

SUBBASINS

1. UPPER WISCONSIN RIVER
2. LAKE DU BAY
3. CASTLE ROCK
4. KICKAPOO RIVER
5. BARABOO RIVER
6. LOWER WISCONSIN RIVER

SEDIMENT YIELD

ACRE FEET PER SQ. MI. PER YEAR

- < 0.01
- 0.01 TO 0.10
- 0.10 TO 0.20
- 0.20 TO 0.30

WISCONSIN

SEDIMENT YIELD MAP

WISCONSIN RIVER BASIN

WISCONSIN AND MICHIGAN

SCALE 1/1,000,000
0 5 10 15 20 25 MILES
0 5 10 15 20 25 30 35 KILOMETERS

SOURCE
FAMILY OF MAPS SCS DRWG NO 5, R-32,569 (2-79)
AND INFORMATION FROM FIELD TECHNICIANS
TRANSVERSE MERCATOR PROJECTION

NOTE: DO NOT USE FOR SMALL WATERSHED DESIGN PURPOSES

Rev. 2-7-79
5,S-36,891

Table 3-11

Flood Prone Areas 1/
Wisconsin River Basin

Subbasin	Land Use					Urban & Built-up Areas			
	Crop-land	Grass-land	Forest Land	Other	Urban & Built-up	Cities	Villages	Unincorp. Areas	Towns
	1000 Acres					number			
Upper Wisconsin	-	30.1	24.4	11.8	0.6	3	-	-	-
DuBay	8.0	40.8	44.2	4.2	0.8	6	9	-	-
Castle Rock	17.7	75.1	37.3	8.3	1.1	10	12	1	12
Baraboo	10.0	17.5	3.8	8.9	0.3	4	11	-	-
Kickapoo	10.8	12.2	2.3	11.9	1.2	-	11	3	-
Lower Wisconsin	29.9	60.8	7.6	3.6	1.1	4	19	13	1
BASIN TOTAL	76.4	236.5 2/	119.6	48.7	5.1	27	62	17	13

1/ Based on a 100-year flood

2/ Includes 75,100 acres of pasture

Sediment Damage From Sheet Erosion,
Plan Area 3

The public identified eight specific watershed areas with flooding problems. See table 3-13 for name and location. These areas were evaluated for feasibility under the Watershed Protection and Flood Prevention Act, Public Law 566. The evaluations indicated that the cost of installing potential structural measures such as floodways, levees, channel modifications, floodwater retarding structures, etc., exceeds the benefits expected by reducing floodwater damages.

Table 3-12

Current and Projected Floodwater Damages
Wisconsin River Basin

Wisconsin River Subbasin	Flood Plain Acres	Average Annual Floodwater Damages					
		Current			Projected Without Resource Development 2000		
		Agric.	Non-agric.	Total	Agric.	Non-agric.	Total
		Dollars					
Upper Wisconsin	66,900	10	120	130	19	226	245
DuBay	98,000	144	135	279	218	255	473
Castle Rock	139,500	417	321	738	634	606	1,240
Baraboo	40,500	245	263	508	380	497	877
Kickapoo	38,400	269	271	540	415	511	926
Lower Wisconsin	103,000	816	500	1,316	1,244	944	2,188
TOTAL BASIN	486,300	1,901	1,610	3,511	2,910	3,039	5,949

Flooding - The Wisconsin River Near Mauston, Plan Area 2

Table 3-13 Areas With Identified Flooding Problems Wisconsin River Basin

County	Watershed
Lake DuBay Subbasin	
Marathon	Bull Junior Creek (Kronenwetter)
Castle Rock Subbasin	
Adams	Friendship - Adams Area
Adams	Big Flats Area
Portage	The Village of Plover Area
Lower Wisconsin Subbasin	
Dane	Black Earth Creek
Iowa & Dane	Blue Mounds Creek (Arena Area)
Grant & Iowa	Blue River
Grant	Crooked - Sanders Creek (Boscobel)

The current rate of development in the village of Plover area, the village of Cross Plains located within the Black Earth Creek watershed, and the Kronenwetter area in the Bull Junior Creek watershed indicate the need for,

and enforcement of, building codes and flood plain ordinances. Some remedial measures such as flood proofing and channel construction and/or modification may also be needed.

In addition to the eight identified areas, the frequency and extent of flooding along the Baraboo and Kickapoo rivers are noteworthy. Fourteen of the 26 incorporated communities subject to flooding in these subbasins have adopted flood plain ordinances. Those communities with ordinances include 9 of the 11 villages in the Kickapoo subbasin and 3 of the 4 cities and 2 of the 11 villages in the Baraboo subbasin. However, the quality of the data used to establish these ordinances varies from historical high watermarks to detailed flood hazard studies.

All of the cities and 56 of the villages are in the Flood Insurance Program administered by the Flood Insurance Administration (FIA), U.S. Department of Housing and Urban Development (HUD). Sixteen cities and 26 villages have adopted flood plain ordinances. Thirteen cities and 14 villages have a detailed flood hazard study for use in their flood management programs. Tables 3-11 and 3-14 list pertinent data for each subbasin.

Table 3-14 Communities Having Flood Plain Management Data
Current and Year 2000
Wisconsin River Basin

Urban and Built-up by Type	Identified	In Flood Insurance Program		Flood Plain Ordinance Adopted		Detailed Flood Hazard Study Available	
		Current	2000	Current	2000	Current	2000
	Number						
Cities	27	27	27	19	22	13	24
Villages	62	60	62	28	48	14	39
Unincorp. Areas	17	17	17	16 1/	17	--	10
Towns	13	13	13	10 1/	13	--	5
BASIN TOTAL	119	113	119	73	100	27	78

1/ County Ordinance Applies

Basinwide, flood hazard data varies from none in some areas to detailed studies in others and is limited in rural areas. Consequently, some development is inadvertently permitted in the flood plains, particularly in the rural areas. While flood hazard information is expected to be available for all the cities and villages in the Basin by 2000, its quality is still expected to

vary considerably. A need exists to have all flood hazard data to equal or exceed a common standard. For example, a flood hazard study should, as a minimum, meet the requirements of the Department of Housing and Urban Development, Federal Insurance Administration's, Type 15 study.

Most of the cities, villages, and counties subject to flooding do not have flood plain management programs, building codes, or land use regulations based on detailed flood hazard and soils information.

CROPLAND WITH WET SOILS

In many parts of the Basin, flooding, sediment deposition, and wet soils are interrelated problems. As such, these not only limit agricultural production but relate to damages to roads, bridges, and other flood plain structures. Within the flood plain, damages caused by the interrelated problems were included in the floodwater damage estimates. Therefore, this discussion will be limited to cropland with wet soils.

About 199,600 acres (80,800 ha) or 8 percent of the total cropland in the Basin has wet soils. Approximately 16,600 acres (6,700 ha) has already been drained by individual landowners. Adequate drainage on the remaining 183,000 acres (74,100 ha) would improve crop production. The ongoing program and present trends will reduce this need to 156,000 acres (63,100 ha) by the year 2000. See table 3-15 for details.

Drainage systems have already been installed on those areas suitable for project type action. These project areas have some serious operation, maintenance and replacement problems. Some problems are design-related, but most are caused by poor management, lack of technical assistance, and institutional arrangements.

Where outlets are readily available, much of the cropland with wet soils has already been drained. For those acres undrained, group action is generally required to provide adequate outlets. Studies for this Basin show that individual onfarm drainage systems are generally not economically feasible for these acres. This indicates a change of land use might occur from cropland to other suitable uses such as permanent hay or wildlife habitat.

RIVER MILES

In order to provide for effective water resource management, information and data must be related hydrologically. One aspect of hydrologic association is the accurate location, identification, and mileage measurement of rivers and streams.

Several systems for identifying locations on the river system are currently being used. A strong concern was expressed for developing a standard base or system for identifying river miles. This concern was resolved during the

study by listing identifiable points on a coordinate system. Existing data were correlated to the coordinate base system. Several agencies were involved in this study, notably the Wisconsin Department of Natural Resources, the U. S. Environmental Protection Agency, the U. S. Geological Survey, and the SCS.

Table 3-15 Current and Projected Cropland Areas With Wet Soils Wisconsin River Basin

County	Current	2000
	---------Acres-------	
Plan Area 1		
Lincoln	6,200	5,900
Plan Area 2		
Adams	4,800	
Juneau	3,100	
Marathon	80,800	
Monroe	2,400	
Portage	10,000	
Wood	41,700	
	142,800	121,400
Plan Area 3		
Columbia	11,700	
Crawford	1,000	
Iowa	1,700	
Richland	3,800	
Sauk	12,800	
Vernon	3,000	
	34,000	10,800
Basin	183,000	138,100

WETLAND HABITAT ALTERATION (encroachment)

Some concern was expressed about the alteration of wildlife habitat, primarily encroachment on wetlands by land development and construction activities. A concomitant concern was the general lack of understanding about the types and values of wetlands.

The implementation of the National and Wisconsin Environmental Policy Acts (NEPA and WEPA) has been instrumental in resolving concerns caused by water resource projects and road construction. In addition, these Acts, notably WEPA, are increasing developer's awareness of the environment. While rates

of encroachment have slowed in recent years, 6,800 acres (2,750 ha) of wetland types 3 through 8 is expected to be lost to development by 2000, table 3-16.

Table 3-16 Wetland Types 3 through 8 [1/]
Wisconsin River Basin

Plan Area	Year 1976	Year 2000
	Acres	
1	441,800	439,600
2	202,500	198,400
3	53,900	53,400
TOTAL	698,200	691,400

[1/] See Fish and Wildlife Circular 39 for explanation of each type.

LAKE OUTLETS

Lake outlets needing repair or replacement were being considered in Plan Areas 1 and 2 as potential resource conservation and development (RC&D) measures. Early in this study, it appeared that the number of potential projects exceeded available funds and the number of allowable construction starts. A concern was expressed regarding the selection of the most worthwhile projects.

This concern has been alleviated or eliminated, particularly in Plan Area 1, for several reasons. First, the expected number of potential project measures did not materialize. Second, State and Federal legislation was enacted to identify needs and establish priorities, to wit:

1. Public Inland Lake Protection and Rehabilitation Act, Wisconsin Statutes, Chapter 33, 1973.

2. Dams and Bridges, Wisconsin Statutes, Chapter 31, Inspection, Section 31.19, 1975.

3. Presidential Directive of 1977 on Dam Safety Inspection.

In Plan Area 1, the evaluation of lake outlets was discontinued because a need no longer existed. In Plan Area 2, within the Golden Sands RC&D Area, 120 publicly-owned flowages were inventoried. Fourteen of these were evaluated. Generally, maintenance of these structures seems to be lacking since woody vegetation, some mature and dying, was observed in the embankments of

most of these flowages. It is anticipated that operation and maintenance plans will be revised and implemented as a result of the dam safety inspections. Most of the flowages evaluated had other problems such as nuisance algae growth and aquatic vegetation, fishkills, etc.

The flowages with the highest public interest are Lake Decorah (Juneau County), McDill Pond (Portage County), and Lake Wazeecha (Wood County). The Lake Decorah association has established a Lake Protection and Rehabilitation District. The Lake Wazeecha and McDill Pond associations are exploring the possibilities of forming a district.

Shoreline Erosion - Petenwell Flowage, Plan Area 2

RECREATION

The public expressed a concern for more access sites and facilities for boats and canoes. In addition, in Plan Area 3, a need was expressed for improved waste disposal facilities at access sites and selected island stopovers on the Wisconsin River.

Present and future needs for Wisconsin outdoor recreational opportunities are specified in the Wisconsin Outdoor Recreation Plan published by the Wisconsin DNR. The 1977 Wisconsin Outdoor Recreation Plan indicates that additional Basin access site needs will be met by ongoing programs.

The major recreational concerns are resource protection and enhancement of existing facilities. The demand for outdoor recreational facilities in Plan Area 1 exceeds supply and it is expected to be compounded in the future because of the large number of users from outside the Basin and State. In Plan Area 2, some additional recreational opportunities will be needed to satisfy future demands. The needs for additional access sites and island stopover areas including waste disposal facilities are expected to be met in Plan Area 3 if the Lower Wisconsin Wild and Scenic River Study Plan is implemented.

SURFACE WATER QUALITY

Passage of the Federal Water Pollution Control Act of 1972 (PL 92-500) and its amendments have led to increased efforts in abating sources of water pollution. In its reports to Congress, the Wisconsin DNR indicated that the effects of point source pollution discharges can be virtually eliminated by 1983, given continued legislative support and adequate funding. 1/ 2/ In the same reports, detailed plans are discussed for dealing with the more elusive problem of nonpoint source areas of water pollution. The subject of nonpoint sources was limited to erosion and sedimentation in this study because its other aspects are being studied by the Wisconsin DNR, agencies of the USDA, the Wisconsin Board of Soil and Water Conservation Districts, the universities, regional planning commissions, and others.

The National goals are expected to be met in the Wisconsin River Basin principally through the elimination of major point sources of water pollution. Major point sources on the upper Wisconsin River above Castle Rock Dam include municipal sewage treatment plants, dairy processing, canning, pulp and paper manufacturing, electric power generation, chemical manufacturing, and electroplating. Although not yet attained, 1983 goals are expected to be met. The lower Wisconsin River, consisting of 148 miles (238 km) of stream below Castle Rock Dam, already meets the National goals set for 1983. Municipal sewage treatment plants are singled out as a main point source contributor which may occasionally violate water quality standards on the lower Wisconsin River.

1/ Wisconsin 1976 Water Quality Inventory Report to Congress, Wisconsin Department of Natural Resources.
2/ Wisconsin 1977 Water Quality Inventory, Wisconsin Department of Natural Resources.

Wisconsin industries have made good progress in meeting 1977 treatment requirements, but municipalities lag. The availability of construction-grant funding will continue to be an important factor in setting the pace for improvements in municipal sewage treatment plants.

Pollution other than that derived from specific point sources are major contributors to water quality degradation. These nonpoint sources include urban storm water runoff, agricultural runoff including soil loss, construction sites, mining areas, and silvicultural activities.

CHAPTER IV
ALTERNATIVE PLANS

CHAPTER 4
ALTERNATIVE PLANS

Nine alternative plans were identified and evaluated as to their impacts in the year 2000. Eight alternatives to solve problems or satisfy needs through the year 2000 were evaluated and presented to the public for their consideration. Each alternative reflects various levels of agricultural tillage and management practices. Two of the alternatives emphasized economic development, five utilized various levels of land treatment to emphasize environmental quality, and one was the continuation of present trends. One additional alternative was formulated to evaluate the impact of removing prime agricultural land from production.

Each of the nine alternatives will be discussed and their impacts presented. All alternatives are subject to the projected condition presented in appendix C.

ALTERNATIVE 1 - Continue Present Trends

Alternative one is the benchmark against which the impacts of other alternative actions are measured. This alternative is the projection of future conditions assuming the continuation of present trends and ongoing programs and projects without any new or accelerated programs.

Table 4-1 presents the future projections in relation to present levels of the same variables. The first portion of the table shows projected changes in major land uses along with some assumed changes in management conditions. This shows that less land is being utilized in each land use category to produce the projected food and fiber output. However, total cropland is projected to increase in Plan Area 2 because some landowners are expanding their operation by clearing forest and/or converting pasture to cropland.

Contour farming and stripcropping are projected to continue to decrease while conservation tillage practices are projected to increase. The increase will be due mainly to past and present emphasis on conservation and the potential impact of present programs such as Section 208 of PL 92-500. Projected returns over budgeted costs from the production of major crops (a measure of income) shows a small decrease (3 percent) in Plan Area 1 because of a projected decrease in agricultural acreage by 2000. The other plan areas show a projected increase in this type of income, 30 percent in Plan Area 2 and 45 percent in Plan Area 3.

Acres exceeding soil loss tolerance are projected to decrease due to the ongoing programs and trends; 77 percent in Plan Area 1, 30 percent in Plan Area 2, and 19 percent in Plan Area 3. However, total soil loss is projected to decrease only 5, 16, and 13 percent, respectively. This indicates that a decreasing number of acres will be cropped more intensively to produce the projected food and fiber output.

Table 4-1

Alternative 1 - Continue Present Trends
Wisconsin River Basin

EFFECTS AND IMPACTS	UNITS	PLAN AREA 1		PLAN AREA 2		PLAN AREA 3		BASIN	
		CURRENT	2000	CURRENT	2000	CURRENT	2000	CURRENT	2000
LAND USE AND TILLAGE		----------	----------	----------	----------	1000 UNITS	----------	----------	----------
Cropland (Total)	acres	91.1	89.3	1,087.6	1,109.4	1,300.6	1,287.5	2,479.3	2,486.2
Conventional Tillage	acres	73.4	52.8	879.8	585.7	683.0	217.5	1,636.2	856.0
Contour Farming	acres	0.3	0.3	25.6	24.6	122.7	117.2	148.7	142.1
Strip Cropping	acres	1.0	0.9	100.0	95.6	360.0	340.9	461.0	437.4
Conservation Tillage	acres	-	-	25.0	75.0	63.0	170.0	88.0	245.0
Idle	acres	16.3	35.3	57.2	328.5	71.8	441.9	145.4	805.7
Pasture Land (Total)	acres	80.8	80.8	465.4	448.9	474.2	473.7	1,020.4	1,003.4
Managed	acres	30.1	3.0	45.8	39.8	138.1	64.0	214.0	106.8
Unmanaged	acres	-	-	419.6	0.4	3.9	87.3	423.5	87.7
Idle (Not Utilized)	acres	50.7	77.8	-	408.7	332.2	322.4	382.9	808.9
Forest Land (Total)	acres	1,399.8	1,349.5	1,455.4	1,403.0	723.2	697.2	3,578.4	3,449.7
Ungrazed	acres	1,368.0	1,318.8	1,184.0	1,141.1	364.5	351.0	2,916.6	2,810.9
Grazed	acres	31.8	30.7	271.4	261.9	358.7	346.2	661.8	638.8
Wetland - Types 3-8	acres	441.8	439.6	202.5	198.4	53.9	53.4	698.2	691.4
ECONOMIC DEVELOPMENT ACCOUNT									
Income									
Crop Production (Major Crops) 1/	dollars	4,733.7	4,564.1	69,339.8	90,336.8	106,388.6	153,943.9	180,462.1	248,844.8
Other	dollars	-	-	-	-	-	-	-	-
Costs									
Installation									
Region	dollars	-	-	-	-	-	-	-	-
Rest of Nation	dollars	-	-	-	-	-	-	-	-
Technical Assistance									
Region	dollars	-	-	-	-	-	-	-	-
Rest of Nation	dollars	-	-	-	-	-	-	-	-
Total Costs									
Region	dollars	-	-	-	-	-	-	-	-
Rest of Nation	dollars	-	-	-	-	-	-	-	-
Net Effects	dollars	4,733.7	4,564.1	69,339.8	90,336.8	106,388.6	153,943.9	180,462.1	248,844.8
ENVIRONMENTAL QUALITY ACCOUNT									
Cropland Exceeding Soil Loss Tolerance	acres	5.6	1.3	266.5	186.3	594.6	482.7	866.7	670.3
Soil Loss (Cropland, Pasture & Forest)	tons	773.9	738.3	5,516.7	4,639.5	8,610.3	7,481.5	14,900.9	12,859.7
Fuel Needs	gallons	418.8	242.4	8,535.7	4,692.8	10,249.9	5,798.9	19,204.4	10,734.1
Amount of Herbicide Use	dollars	-	-	1,059.9	760.1	1,814.3	1,341.3	2,866.2	2,101.4
Amount of Pesticide Use	dollars	21.8	18.5	1,969.1	1,827.3	3,438.6	3,274.5	5,429.5	5,120.3
Fertilizer Needs									
N - Nitrogen	pounds	166.3	145.9	1,619.4	1,923.9	1,647.0	1,833.4	3,432.7	3,903.2
P - Phosphorus	pounds	2,943.2	2,122.8	39,248.1	29,203.8	51,845.8	35,926.4	94,037.0	67,253.0
K - Potassium	pounds	2,943.2	2,122.8	39,248.1	29,203.8	51,845.8	35.926.4	94,037.0	67,253.0
Amount of Wildlife Food & Cover	acres	-	-	-	-	-	-	-	-
SOCIAL WELL-BEING ACCOUNT		----------	----------	----------	----------	ACTUAL UNITS	----------	----------	----------
Employment									
On-Farm	man-years	66.9	39.2	1,290.9	693.1	1,480.3	813.1	2,838.1	1,545.4
Technical Assistance	man-years	-	-	-	-	-	-	-	-

1/ Crop production income is return over budgeted cost for major crops only. These include corn, silage, oats, hay, cropland pasture and managed and unmanaged permanent pasture.

Contour Stripcropping, Plan Area 3

The factors of production (fertilizer, fuel, etc.) are projected to decrease along with acreage, except for nitrogen fertilizer. The additional nitrogen reflects the increased intensity of cropping certain acres.

ALTERNATIVE 2 - National Economic Development (NED) Plan

This alternative was formulated to emphasize economic developments by bringing idle crop and pastureland into production. Plan elements include managing 6,000 acres (2,400 ha) of unmanaged pastureland, utilizing 303,800 acres (122,900 ha) of idle pastureland, and cropping 501,900 (203,100 ha) of idle cropland. The return over budgeted cost from major crop production is projected to increase 26 percent for the Basin, table 4-2. Plan Area 1 incurs some implementation cost from pasture management. The increased Basin crop production levels were corn, 25 percent; silage, 23 percent; oats, 23 percent; hay, 42 percent; cropland pasture, 2 percent; managed pasture, 5 percent; and unmanaged pasture, 414 percent. However, the return was calculated using only the budgeted costs, which assumed no cost for converting idle cropland and pasture into productive cropland and pasture.

Table 4-2 Alternative 2 - National Economic Development (NED) Plan, 2000
Wisconsin River Basin

EFFECTS AND IMPACTS	UNITS	PLAN AREA 1	PLAN AREA 2	PLAN AREA 3	BASIN
LAND USE AND TILLAGE		----------1000 UNITS----------			
Cropland (Total)	acres	-	-	-	-
Conventional Tillage	acres	(+) 13.3	(+) 265.5	(+) 223.1	(+) 501.9
Contour Farming	acres	-	-	-	-
Strip Cropping	acres	-	-	-	-
Conservation Tillage	acres	-	-	-	-
Idle	acres	(-) 13.3	(-) 265.5	(-) 223.1	(-) 501.9
Pasture Land (Total)	acres	(+) 6.0	-	-	(+) 6.0
Managed	acres	-	(+) 118.6	(+) 185.3	(+) 303.9
Unmanaged	acres	(-) 6.0	(-) 118.6	(-) 185.3	(-) 303.9
Idle (Not Utilized)	acres	-	-	-	-
Forest Land (Total)	acres	-	-	-	-
Ungrazed	acres	-	-	-	-
Grazed	acres	-	-	-	-
NATIONAL ECONOMIC DEVELOPMENT ACCOUNT					
Income					
Crop Production (Major Crops) 1/	dollars	(+) 1,353.5	(+) 20,360.9	(+) 42,871.6	(+) 64,586.0
Other	dollars	-	-	-	-
Costs					
Installation					
Region	dollars	(+) 105.0	-	-	(+) 105.0
Rest of Nation	dollars	(+) 45.0	-	-	(+) 45.0
Technical Assistance					
Region	dollars	(+) 0.2	-	-	(+) 0.2
Rest of Nation	dollars	(+) 0.4	-	-	(+) 0.4
Total Costs					
Region	dollars	(+) 105.2	-	-	(+) 105.2
Rest of Nation	dollars	(+) 45.4	-	-	(+) 45.4
Net Effects	dollars	(+) 1,202.9	(+) 20,360.9	(+) 42,871.6	(+) 64,435.4
ENVIRONMENTAL QUALITY ACCOUNT					
Cropland Exceeding Soil Loss Tolerance	acres	-	-	(-) 17.9	(-) 17.9
Soil Loss (Cropland, Pasture & Forest)	tons	(+) 5.1	(+) 700.4	(+) 4,405.1	(+) 5,110.6
Fuel Needs	gallons	(+) 85.1	(+) 2,105.7	(+) 2,297.4	(+) 4,488.2
Amount of Herbicide Use	dollars	-	(+) 297.2	(+) 448.4	(+) 745.6
Amount of Pesticide Use	dollars	(+) 6.3	(+) 641.4	(+) 941.4	(+) 1,589.1
Fertilizer Needs					
N - Nitrogen	pounds	(+) 39.8	(+) 725.4	(+) 468.4	(+) 1,233.6
P - Phosphorus	pounds	(+) 580.7	(+) 10,787.2	(+) 10,497.7	(+) 21,865.6
K - Potassium	pounds	(+) 580.7	(+) 10,787.2	(+) 10,497.7	(+) 21,865.6
Amount of Wildlife Food and Cover	acres	-	-	-	-
SOCIAL WELL-BEING ACCOUNT		----------ACTUAL UNITS----------			
Employment					
On-Farm	man-years	(+) 13.6	(+) 312.2	(+) 322.8	(+) 648.6
Technical Assistance	man-years	(+) 0.1	-	-	(+) 0.1

1/ Crop production income is return over budgeted cost for major crops only. These include corn, silage, oats, hay, cropland pasture and managed and unmanaged permanent pasture.

Wildlife habitat will change by implementing this alternative. A change of species composition will occur. More intensive use of the land for agriculture will favor open land wildlife. Woodland species and those that occupy successional stages of plant communities will be adversely affected by intensifying land use. A precise assessment of the impacts on wildlife by implementing this or the other alternatives would require each species currently inhabiting an area to be evaluated independently. These evaluations were not undertaken for this study.

Utilizing the extra crop and pastureland incurs a cost in terms of input needs. Usage of fuel, labor, pesticides, and fertilizers increase substantially, ranging from 33 to 42 percent. Total soil loss is projected to increase 40 percent due to the larger number of production acres. On the other hand, there is a projected decrease in crop acres exceeding soil loss tolerance. This occurs because of the added flexibility between soils and rotations gained from the increased acreages allows a lesser number of acres to be cropped so intensively as to exceed the soil loss tolerance level. Thus, a soil conservation program tied exclusively to the number of acres exceeding soil loss tolerance may not have the desired impact of reducing soil loss, particularly if production levels are maintained or increased. The total increased soil loss from cropping idle acres to maintain production levels could easily exceed the tons of soil saved by treating the program acres. The data in table 4-2 and subsequent tables for other alternatives indicate changes from the levels shown in alternative 1.

ALTERNATIVE 3 - Environmental Quality (EQ) Plan

Alternative 3 outlines programs and developments that would emphasize the protection and enhancement of the environment. The plan elements include accelerating land treatment at a high rate, establishing outdoor displays identifying wetland types 3 through 8 and explaining their values, preserving existing wetlands, establishing wildlife food and cover on farmland, protecting shorelines and streambanks, and developing strategies for flood plain management programs. The accelerated land treatment measures of this alternative include: (1) converting 7,600 acres (3,100 ha) of cropland to pasture, (2) converting 34,400 acres (13,900 ha) to a permanent hay or cropland pasture rotation, (3) increasing conservation tillage by 70,100 acres (28,400 ha), (4) increasing contour farming by 22,500 acres (9,100 ha), (5) increasing stripcropping by 66,600 acres (27,000 ha), (6) converting 104,700 acres (42,400 ha) to less intensive rotation, (7) increasing managed pasture by 56,100 acres (22,700 ha), (8) removing livestock from 447,100 acres (181,000 ha) of forest land, and (9) installing 650 miles (1,050 km) of terraces. Table 4-3 shows the plan area breakdown of these plan elements.

Table 4-3

Alternative 3 - Plan Elements
Wisconsin River Basin

	Units	Plan Area 1	Plan Area 2	Plan Area 3	Basin
		1000 units			
Change rotation to permanent hay or cropland pasture	acres	(+) 0.20	(+) 4.60	(+) 29.60	(+) 34.40
Change cropland to pasture	acres	-	(+) 1.00	(+) 6.60	(+) 7.60
Increase conservation tillage	acres	(+) 1.20	(+) 19.00	(+) 49.90	(+) 70.10
Increase contour farming	acres	(+) 0.40	(+) 6.10	(+) 16.00	(+) 22.50
Increase stripcropping	acres	(+) 1.00	(+) 17.70	(+) 47.00	(+) 66.60
Change to less intensive rotations	acres	-	(+) 28.80	(+) 75.90	(+) 104.70
Increase amount managed pasture	acres	(+) 5.30	(+) 31.40	(+) 19.40	(+) 56.10
Remove livestock from forest land	acres	(+) 21.50	(+) 183.30	(+) 242.30	(+) 447.10
Install terraces	miles	-	(+) 0.30	(+) 0.35	(+) 0.65
Acquire wetlands	acres	(+) 2.20	(+) 4.10	(+) 0.50	(+) 6.80
Establish wildlife food & cover	acres	(+) 8.00	(+) 20.00	(+) 20.00	(+) 48.00
Protect shorelines & streambanks	miles	(+) -	(+) 0.05	(+) 0.17	(+) 0.22
Establish wetland exhibits Types 3-8 and values	Actual Units number	(+) 6	(+) 12	(+) 12	(+) 30
Develop flood plain management programs	number	(+) 2	(+) 8	(+) 18	(+) 28

Pasture Management and Contour Stripcropping - Coordinated Management Practices, Plan Area 3

Fully implemented, this plan would:

1. Enhance quality aspects of land and water by reducing cropland, pasture, and forest soil erosion by 4,192,500 tons (3,803,400 tonnes) annually.

2. Preserve and enhance wildlife habitat by acquiring 6,800 acres (2,800 ha) of wetland types 3 through 8.

3. Establish wildlife food and cover on 48,000 acres (19,400 ha).

4. Reduce future floodwater damages and discourage wildlife habitat alteration by restricting development (homes, buildings, etc.) on 79,000 acres (32,000 ha) of undeveloped flood plain.

5. Protect 200 miles (320 km) of perennial streambank and shoreline by fencing, bank sloping and seeding, or riprap.

6. Enhance fish habitat by reducing soil erosion and protecting streambanks.

A reduction of 126,100 acres (51,000 ha) in cropland exceeding soil loss tolerance is projected, along with a 4.2 million tons (3.8 million tonnes) reduction in Basin soil loss. In Plan Areas 2 and 3, there is a projected decrease in fuel, pesticide, and labor requirements and an increase in fertilizer needs. The increased fertilizer requirement stems from maintaining production levels while reducing tillage operations in order to decrease cropland soil loss.

The total cost of implementing this plan is about 77.1 million dollars, table 4-4, including a 48 million dollar cost to the region and a 29 million dollar cost to the rest of the nation. In addition, projections show an additional 6.4 million dollar decrease in return over budget cost from major crop production.

The cost of implementation was subdivided into installation and technical assistance. These were further divided because of cost-sharing programs into regional (local) and national costs. Installation costs include such things as rental of contract equipment, labor, materials, and landrights. Technical assistance generally consists of those things needed to assist with project or measure implementation such as planning, engineering, acquiring landrights, construction inspection, and other related activities.

The cost of installing conservation measures, protection of shorelines and streambanks, and establishing wildlife food and cover will be borne by landowners and operators who may receive financial assistance through cost-sharing programs. Removal of livestock from forest land will be accomplished primarily by fencing. Protection of shorelines and streambanks includes such items as livestock exclusion (fencing), shaping and seeding, and rock riprap. Establishing food and cover on odd areas of agricultural land will help assist a wildlife management objective of increasing the diversity of cover types and age classes (successional stages) of cover. For example, convert odd areas like point rows, fence lines, or corners of fields irrigated with center pivot systems to wildlife habitat.

The cost of preserving wetlands includes acquisition (installation) and identification, evaluation, etc. (technical assistance) of wetlands subject to encroachment or loss because of development or other competing uses. Acquisition is expected to be by fee simple title and paid for by regional (local) funds. Landrights may also be acquired by donation or easement.

The cost for establishing outdoor displays identifying types 3 through 8 wetlands is based on two displays for each county in the three plan areas. The displays could be located at waysides overlooking or adjacent to high value wetlands. The exhibits could consist of a signboard with a map or photographs identifying the wetland type(s) being observed along with an explanation of its value to the ecosystem. Wherever possible, public awareness to wetland values could be further enhanced by developing a nature trail including plant identification stops through the wetland.

Table 4-4

Alternative 3 - Environmental Quality (EQ) Plan, 2000
Wisconsin River Basin

EFFECTS AND IMPACTS	UNITS	PLAN AREA 1	PLAN AREA 2	PLAN AREA 3	BASIN
LAND USE AND TILLAGE			1000 UNITS		
Cropland (Total)	acres	-	(-) 1.0	(-) 6.6	(-) 7.6
Conventional Tillage	acres	(-) 2.5	(-) 40.9	(-) 60.1	(-) 103.5
Contour Farming	acres	(+) 0.4	(+) 6.1	(+) 16.0	(+) 22.5
Strip Cropping	acres	(+) 1.0	(+) 17.7	(+) 47.9	(+) 66.6
Conservation Tillage	acres	(+) 1.2	(+) 19.0	(+) 49.9	(+) 70.1
Idle	acres	(-) 0.1	(-) 2.9	(-) 60.3	(-) 63.3
Pasture Land (Total)	acres	-	(+) 1.0	(+) 6.6	(+) 7.6
Managed	acres	(+) 5.3	(+) 31.4	(+) 19.4	(+) 56.1
Unmanaged	acres	-	(-) 0.4	(-) 87.3	(-) 87.7
Idle (Not Utilized)	acres	(-) 5.3	(-) 29.9	(+) 74.6	(+) 39.4
Forest Land (Total)	acres	-	-	-	-
Ungrazed	acres	(+) 21.5	(+) 183.3	(+) 242.3	(+) 447.1
Grazed	acres	(-) 21.5	(-) 183.3	(-) 242.3	(-) 447.1
NATIONAL ECONOMIC DEVELOPMENT ACCOUNT					
Income					
Crop Production (Major Crops) 1/	dollars	(-) 66.8	(-) 407.9	(-) 5,951.1	(-) 6,425.8
Other	dollars	-	-	-	-
Costs					
Installation					
Conservation Measures					
Region	dollars	(+) 1,274.2	(+) 9,588.9	(+) 10,518.8	(+) 21,381.9
Rest of Nation	dollars	(+) 4.0	(+) 664.8	(+) 884.6	(+) 1,553.4
Wetland Acquisition					
Region	dollars	(+) 770.0	(+) 2,050.0	(+) 300.0	(+) 3,120.0
Rest of Nation	dollars	-	-	-	-
Establish Wetland Exhibits					
Region	dollars	(+) 6.0	(+) 12.0	(+) 12.0	(+) 30.0
Rest of Nation	dollars	-	-	-	-
Wildlife Food and Cover					
Region	dollars	(+) 600.0	(+) 1,500.0	(+) 1,500.0	(+) 3,600.0
Rest of Nation	dollars	(+) 600.0	(+) 1,500.0	(+) 1,500.0	(+) 3,600.0
Shoreline and Streambank Protection					
Region	dollars	-	(+) 5,002.0	(+) 11,615.0	(+) 16,617.0
Rest of Nation	dollars	-	(+) 4,168.0	(+) 14,778.0	(+) 18,946.0
Flood Plain Management Programs					
Region	dollars	-	-	-	-
Rest of Nation	dollars	-	-	-	-
Technical Assistance					
Conservation Measures					
Region	dollars	(+) 8.4	(+) 105.3	(+) 148.1	(+) 261.8
Rest of Nation	dollars	(+) 34.0	(+) 421.4	(+) 592.5	(+) 1,047.9
Wetland Acquisition					
Region	dollars	(+) 37.0	(+) 98.4	(+) 14.4	(+) 149.8
Rest of Nation	dollars	(+) 9.2	(+) 24.6	(+) 3.6	(+) 37.4
Establish Wetland Exhibits					
Region	dollars	(+) 0.9	(+) 1.8	(+) 1.8	(+) 4.5
Rest of Nation	dollars	-	-	-	-
Wildlife Food and Cover					
Region	dollars	(+) 0.2	(+) 0.4	(+) 0.4	(+) 1.0
Rest of Nation	dollars	(+) 0.6	(+) 1.6	(+) 1.6	(+) 3.8
Shoreline and Streambank Protection					
Region	dollars	-	(+) 828.5	(+) 1,914.2	(+) 2,742.7
Rest of Nation	dollars	-	(+) 730.0	(+) 2,588.0	(+) 3,318.0
Flood Plain Management Programs					
Region	dollars	(+) 10.7	(+) 32.5	(+) 115.5	(+) 158.7
Rest of Nation	dollars	(+) 38.5	(+) 116.9	(+) 416.8	(+) 572.2
Total Costs					
Region	dollars	(+) 2,707.4	(+) 19,219.8	(+) 26,140.2	(+) 48,067.4
Rest of Nation	dollars	(+) 636.3	(+) 7,627.3	(+) 20,765.1	(+) 29,078.7
Net Effects	dollars	(-) 3,460.5	(-) 27,255.0	(-) 52,856.4	(-) 83,571.8
ENVIRONMENTAL QUALITY ACCOUNT					
Cropland Exceeding Soil Loss Tolerance	acres	-	(-) 31.1	(-) 95.0	(-) 126.1
Soil Loss (Cropland, Pasture and Forest)	tons	(-) 148.4	(-) 1,446.2	(-) 2,597.9	(-) 4,192.5
Fuel Needs	gallons	(-) 0.2	(-) 37.8	(-) 108.7	(-) 146.7
Amount of Herbicide Use	dollars	-	(-) 10.4	(-) 22.8	(-) 33.2
Amount of Pesticide Use	dollars	(+) 0.8	(-) 42.0	(-) 95.6	(-) 136.8
Fertilizer Needs					
N - Nitrogen	pounds	(-) 0.3	(+) 5.6	(+) 118.5	(+) 123.8
P - Phosphorus	pounds	(-) 3.7	(+) 109.0	(+) 2,109.4	(+) 2,214.7
K - Potassium	pounds	(-) 3.7	(+) 109.0	(+) 2,109.4	(+) 2,214.7
Amount of Wildlife Food and Cover	acres	(+) 8.0	(+) 20.0	(+) 20.0	(+) 48.0
SOCIAL WELL-BEING ACCOUNT			ACTUAL UNITS		
Employment					
On-Farm	man-years	(-) 0.1	(-) 5.5	(-) 13.1	(-) 18.7
Technical Assistance	man-years	(+) 1.4	(+) 6.3	(+) 21.2	(+) 28.9

1/ Crop production income is return over budgeted cost for major crops only. These include corn, silage, oats, hay, cropland pasture, and managed and unmanaged permanent pasture.

Wetland Habitat, Plan Area 3

The cost of developing flood plain management programs includes developing and interpreting flood hazard and flood plain information and formulating a program for local administration based on that information. Considering the availability of known data, costs were developed based on the scope of the flood hazard data and other information needed to formulate a program for (1) small communities, (2) large communities, or (3) a subbasin like the Baraboo which includes cities, villages, and portions of several counties.

ALTERNATIVE 4

Plan 4 emphasizes economic development by increasing crop production efficiency. The present trend of reducing the contour farming and stripcropping acreages will be accelerated. This increases efficiency because these are the high-cost farming practices. As a result more acres will be idled and more unmanaged permanent pasture will be used.

Major crop return over budgeted cost is projected to increase $1,622,500. The alternative would also require an implementation cost of $137,500.

See table 4-5 for details. Other impacts include an increase in acres exceeding soil loss tolerance and a 16 percent increase in soil loss. This increase in Basin soil loss includes a projected decrease in Plan Area 2. Most production inputs are projected to decrease except nitrogen fertilizer in Plan Area 2 and pesticides in Plan Areas 2 and 3.

ALTERNATIVE 5

Alternative 5 is designed to accelerate land treatment beyond the ongoing program at a low rate. The plan elements are: (1) increase conservation tillage 10,000 acres (4,000 ha), (2) increase contour farming 3,200 acres (1,300 ha), (3) increase stripcropping 9,600 acres (3,900 ha), (4) convert 1,100 acres (450 ha) from cropland to pasture, (5) convert 5,000 acres (2,000 ha) from cropland to permanent hay or cropland pasture rotations, (6) convert 14,900 acres (6,000 ha) to less intensive rotations, and (7) install 90 miles (145 km) of terraces.

Implementation of these plan elements will utilize some idle cropland and increase idle pasture, table 4-6. The implementation cost would be about $897,000. An additional $603,000 decrease in value of major crop production is projected because of the decreased tillage intensity on a greater number of acres. Soil loss is projected to decrease about 2.5 percent along with a reduction of 18,700 acres (7,600 ha) of cropland exceeding tolerance level. Production inputs of fuel, labor, and pesticides are projected to decrease while fertilizers increase. These input changes are the result of attempting to maintain production levels under decreased tillage intensity.

ALTERNATIVE 6

Alternative 6 is designed to accelerate land treatment beyond the ongoing program at a medium rate. The plan elements are: (1) increase conservation tillage 50,100 acres (20,300 ha), (2) increase contour farming 16,000 acres (6,500 ha), (3) increase stripcropping 47,700 acres (19,300 ha), (4) convert 5,400 acres (2,200 ha) from cropland to pasture, (5) convert 24,400 acres (9,900 ha) from cropland to permanent hay or cropland pasture rotations, (6) convert 74,800 acres (30,300 ha) to less intensive rotations, and (7) install 450 miles (720 km) of terraces.

The impacts of this alternative also reduce idle cropland and increase idle pasture acres, table 4-7. Total implementation cost is projected to be about $4.3 million. Soil loss is reduced nearly seven percent. Annual return over budget cost from the production of major crops is projected to decrease about $3.5 million. Levels of fuel, labor, and pesticides are projected to decrease while fertilizer usage increases.

Table 4-5

Alternative 4, 2000
Wisconsin River Basin

EFFECTS AND IMPACTS	UNITS	PLAN AREA 1	PLAN AREA 2	PLAN AREA 3	BASIN
LAND USE AND TILLAGE		---1000 UNITS---			
Cropland (Total)	acres	-	-	-	-
Conventional Tillage	acres	(+) 0.9	(-) 14.2	(+) 130.5	(+) 117.2
Contour Farming	acres	(-) 0.2	(-) 19.2	(-) 92.0	(-) 111.4
Strip Cropping	acres	(-) 0.7	(-) 75.0	(-) 268.0	(-) 343.7
Conservation Tillage	acres	-	(+) 95.0	(+) 180.0	(+) 275.0
Idle	acres	-	(+) 13.4	(+) 49.5	(+) 62.9
Pasture Land (Total)	acres	-	-	-	-
Managed	acres	-	-	-	-
Unmanaged	acres	-	(+) 34.9	(+) 94.6	(+) 129.5
Idle (Not Utilized)	acres	-	(-) 34.9	(-) 94.6	(-) 129.5
Forest Land (Total)	acres	-	-	-	-
Ungrazed	acres	-	-	-	-
Grazed	acres	-	-	-	-
NATIONAL ECONOMIC DEVELOPMENT ACCOUNT					
Income					
Crop Production (Major Crops) 1/	dollars	(+) 2.2	(+) 258.6	(+) 1,361.7	(+) 1,622.5
Other	dollars	-	-	-	-
Costs					
Installation					
Region	dollars	-	-	-	-
Rest of Nation	dollars	-	-	-	-
Technical Assistance					
Region	dollars	-	(+) 2.4	(+) 6.3	(+) 8.7
Rest of Nation	dollars	-	(+) 45.1	(+) 83.7	(+) 128.8
Total Costs					
Region	dollars	-	(+) 2.4	(+) 6.3	(+) 8.7
Rest of Nation	dollars	-	(+) 45.1	(+) 83.7	(+) 128.8
Net Effects	dollars	(+) 2.2	(+) 211.1	(+) 1,271.7	(+) 1,485.0
ENVIRONMENTAL QUALITY ACCOUNT					
Cropland Exceeding Soil Loss Tolerance	acres	-	(+) 32.5	(+) 31.8	(+) 64.3
Soil Loss (Cropland, Pasture & Forest)	tons	(+) 0.4	(-) 1.5	(+) 1,995.4	(+) 1,994.3
Fuel Needs	gallons	(-) 0.2	(-) 65.1	(-) 338.9	(-) 404.2
Amount of Herbicide Use	dollars	-	(-) 10.6	(-) 38.6	(-) 49.2
Amount of Pesticide Use	dollars	-	(+) 45.2	(+) 272.5	(+) 317.7
Fertilizer Needs					
N - Nitrogen	pounds	(-) 0.1	(+) 10.2	(-) 5.0	(+) 5.1
P - Phosphorus	pounds	(-) 1.2	(-) 531.2	(-) 1,981.9	(-) 2,514.3
K - Potassium	pounds	(-) 1.2	(-) 531.2	(-) 1,981.9	(-) 2,514.3
Amount of Wildlife Food and Cover	acres	-	-	-	-
SOCIAL WELL-BEING ACCOUNT		---ACTUAL UNITS---			
Employment					
On-Farm	man-years	(-) 0.1	(-) 10.2	(-) 44.4	(-) 54.7
Technical Assistance	man-years	-	(+) 2.9	(+) 5.5	(+) 8.4

1/ Crop production income is return over budgeted cost for major crops only. These include corn, silage, oats, hay, cropland pasture and managed and unmanaged permanent pasture.

Table 4-6

Alternative 5, 2000
Wisconsin River Basin

EFFECTS AND IMPACTS	UNITS	PLAN AREA 1	PLAN AREA 2	PLAN AREA 3	BASIN
LAND USE AND TILLAGE			1000 UNITS		
Cropland (Total)	acres	-	(-) 0.2	(-) 0.9	(-) 1.1
Conventional Tillage	acres	(-) 0.4	(-) 5.8	(-) 12.0	(-) 18.2
Contour Farming	acres	-	(+) 0.9	(+) 2.3	(+) 3.2
Strip Cropping	acres	(+) 0.2	(+) 2.5	(+) 6.9	(+) 9.6
Conservation Tillage	acres	(+) 0.2	(+) 2.7	(+) 7.1	(+) 10.0
Idle	acres	-	(-) 0.5	(-) 5.2	(-) 5.7
Pasture Land (Total)	acres	-	(+) 0.2	(+) 0.9	(+) 1.1
Managed	acres	-	(-) 1.5	(+) 0.8	(-) 0.7
Unmanaged	acres	-	(-) 0.4	(-) 15.5	(-) 15.9
Idle (Not Utilized)	acres	-	(+) 2.2	(+) 15.5	(+) 17.7
Forest Land (Total)	acres	-	-	-	-
Ungrazed	acres	-	-	-	-
Grazed	acres	-	-	-	-
NATIONAL ECONOMIC DEVELOPMENT ACCOUNT					
Income					
Crop Production (Major Crops) 1/	dollars	(-) 0.1	(+) 17.5	(-) 620.2	(-) 602.8
Other	dollars	-	-	-	-
Costs					
Installation					
Region	dollars	(+) 0.6	(+) 81.1	(+) 113.7	(+) 195.4
Rest of Nation	dollars	-	(+) 263.4	(+) 358.2	(+) 621.6
Technical Assistance					
Region	dollars	(+) 0.1	(+) 5.9	(+) 9.9	(+) 15.9
Rest of Nation	dollars	(+) 0.3	(+) 23.5	(+) 40.1	(+) 63.9
Total Costs					
Region	dollars	(+) 0.7	(+) 87.0	(+) 123.6	(+) 211.3
Rest of Nation	dollars	(+) 0.3	(+) 286.9	(+) 398.3	(+) 685.5
Net Effects	dollars	(-) 1.1	(-) 356.4	(-) 1,142.1	(-) 1,499.6
ENVIRONMENTAL QUALITY ACCOUNT					
Cropland Exceeding Soil Loss Tolerance	acres	-	(-) 5.5	(-) 13.2	(-) 18.7
Soil Loss (Cropland, Pasture & Forest)	tons	(-) 0.5	(-) 26.2	(-) 292.7	(-) 319.4
Fuel Needs	gallons	(-) 0.1	(-) 6.1	(-) 35.0	(-) 41.2
Amount of Herbicide Use	dollars	-	(-) 1.4	(-) 8.3	(-) 9.7
Amount of Pesticide Use	dollars	(+) 0.1	(-) 5.6	(-) 10.2	(-) 15.7
Fertilizer Needs					
N - Nitrogen	pounds	-	(+) 0.4	(+) 16.1	(+) 16.5
P - Phosphorus	pounds	-	(+) 17.9	(+) 158.5	(+) 176.4
K - Potassium	pounds	-	(+) 17.9	(+) 158.5	(+) 176.4
Amount of Wildlife Food and Cover	acres	-	-	-	-
SOCIAL WELL-BEING ACCOUNT			ACTUAL UNITS		
Employment					
On-Farm	man-years	(-) 0.4	(-) 0.9	(-) 4.5	(-) 5.8
Technical Assistance	man-years	(+) 0.1	(+) 1.8	(+) 3.0	(+) 4.9

1/ Crop production income is return over budgeted cost for major crops only. These include corn, silage, oats, hay, cropland pasture and managed and unmanaged permanent pasture.

Table 4-7

Alternative 6, 2000
Wisconsin River Basin

EFFECTS AND IMPACTS	UNITS	PLAN AREA 1	PLAN AREA 2	PLAN AREA 3	BASIN
LAND USE AND TILLAGE		----------1000 UNITS----------			
Cropland (Total)	acres	-	(-) 0.7	(-) 4.7	(-) 5.4
Conventional Tillage	acres	(-) 1.8	(-) 27.5	(-) 41.6	(-) 70.9
Contour Farming	acres	(+) 0.3	(+) 4.3	(+) 11.4	(+) 16.0
Strip Cropping	acres	(+) 0.8	(+) 12.7	(+) 34.2	(+) 47.7
Conservation Tillage	acres	(+) 0.8	(+) 13.6	(+) 35.7	(+) 50.1
Idle	acres	(-) 0.1	(-) 3.8	(-) 44.4	(-) 48.3
Pasture Land (Total)	acres	-	(+) 0.7	(+) 4.7	(+) 5.4
Managed	acres	-	(-) 9.8	(-) 7.7	(-) 17.5
Unmanaged	acres	-	(-) 0.4	(-) 87.3	(-) 87.7
Idle (Not Utilized)	acres	-	(+) 10.9	(+) 99.8	(+) 110.7
Forest Land (Total)	acres	-	-	-	-
Ungrazed	acres	-	-	-	-
Grazed	acres	-	-	-	-
NATIONAL ECONOMIC DEVELOPMENT ACCOUNT					
Income					
Crop Production (Major Crops) 1/	dollars	(-) 1.9	(+) 109.9	(-) 3,588.3	(-) 3,480.3
Other	dollars	-	-	-	-
Costs					
Installation					
Region	dollars	(+) 4.1	(+) 405.0	(+) 594.7	(+) 1,003.8
Rest of Nation	dollars	(+) 4.8	(+) 1,353.9	(+) 1,654.5	(+) 3,013.2
Technical Assistance					
Region	dollars	(+) 0.6	(+) 29.5	(+) 31.9	(+) 62.0
Rest of Nation	dollars	(+) 2.3	(+) 117.7	(+) 127.6	(+) 247.6
Total Costs					
Region	dollars	(+) 4.7	(+) 434.5	(+) 626.6	(+) 1,065.8
Rest of Nation	dollars	(+) 7.1	(+) 1,471.6	(+) 1,782.1	(+) 3,206.8
Net Effects	dollars	(-) 13.7	(-) 1,796.2	(-) 5,997.0	(-) 7,806.9
ENVIRONMENTAL QUALITY ACCOUNT					
Cropland Exceeding Soil Loss Tolerance	acres	-	(-) 27.3	(-) 54.2	(-) 81.5
Soil Loss (Cropland, Pasture & Forest)	tons	(-) 1.6	(-) 152.8	(-) 698.5	(-) 852.9
Fuel Needs	gallons	(-) 0.3	(-) 35.6	(-) 110.1	(-) 146.0
Amount of Herbicide Use	dollars	-	(-) 6.2	(-) 20.3	(-) 26.5
Amount of Pesticide Use	dollars	(+) 0.6	(-) 26.8	(-) 77.6	(-) 103.8
Fertilizer Needs					
N - Nitrogen	pounds	(-) 0.1	(+) 2.4	(+) 75.0	(+) 77.3
P - Phosphorus	pounds	(+) 2.5	(+) 147.6	(+) 1,530.8	(+) 1,680.9
K - Potassium	pounds	(+) 2.5	(+) 147.6	(+) 1,530.8	(+) 1,680.9
Amount of Wildlife Food and Cover	acres	-	-	-	-
SOCIAL WELL-BEING ACCOUNT		----------ACTUAL UNITS----------			
Employment					
On-Farm	man-years	(-) 0.1	(-) 5.1	(-) 13.4	(-) 18.6
Technical Assistance	man-years	(+) 0.2	(+) 8.9	(+) 9.6	(+) 18.7

1/ Crop production income is return over budgeted cost for major crops only. These include corn, silage, oats, hay, cropland pasture and managed and unmanaged permanent pasture.

Conservation Tillage, Plan Area 3

ALTERNATIVE 7

This plan was formulated to emphasize soil conservation by changing the levels of tillage practices and rotations. The plan elements include an increase in contour farming and conservation tillage acres with a corresponding decrease in conventional tillage. The magnitudes are shown in table 4-8.

Table 4-8

Alternative 7, 2000
Wisconsin River Basin

EFFECTS AND IMPACTS	UNITS	PLAN AREA 1	PLAN AREA 2	PLAN AREA 3	BASIN
LAND USE AND TILLAGE		----------1000 UNITS----------			
Cropland (Total)	acres	-	-	-	-
Conventional Tillage	acres	(-) 7.7	(-) 168.4	(-) 27.8	(-) 203.9
Contour Farming	acres	(+) 5.1	(+) 35.7	(+) 4.0	(+) 44.8
Strip Cropping	acres	(+) 2.6	-	-	(+) 2.6
Conservation Tillage	acres	-	(+) 127.4	(+) 31.6	(+) 159.0
Idle	acres	-	(+) 5.3	(-) 7.8	(-) 2.5
Pasture Land (Total)	acres	-	-	-	-
Managed	acres	-	(+) 0.3	(-) 15.0	(-) 14.7
Unmanaged	acres	-	(-) 0.3	(+) 15.0	(+) 14.7
Idle (Not Utilized)	acres	-	-	-	-
Forest Land (Total)	acres	-	-	-	-
Ungrazed	acres	-	-	-	-
Grazed	acres	-	-	-	-
NATIONAL ECONOMIC DEVELOPMENT ACCOUNT					
Income					
Crop Production (Major Crops) 1/	dollars	(-) 10.9	(+) 325.9	(-) 21.7	(+) 293.3
Other	dollars	-	-	-	-
Costs					
Installation					
Region	dollars	(+) 30.9	(+) 107.1	(+) 12.0	(+) 150.0
Rest of Nation	dollars	(+) 10.4	-	-	(+) 10.4
Technical Assistance					
Region	dollars	(+) 2.7	(+) 9.1	(+) 1.0	(+) 12.8
Rest of Nation	dollars	(+) 10.7	(+) 36.6	(+) 4.1	(+) 51.4
Total Costs					
Region	dollars	(+) 33.6	(+) 116.2	(+) 13.0	(+) 162.8
Rest of Nation	dollars	(+) 21.1	(+) 36.6	(+) 4.1	(+) 61.8
Net Effects	dollars	(-) 65.6	(+) 173.1	(-) 38.8	(+) 68.7
ENVIRONMENTAL QUALITY ACCOUNT					
Cropland Exceeding Soil Loss Tolerance	acres	-	(-) 20.8	(+) 11.3	(-) 9.5
Soil Loss (Cropland, Pasture & Forest)	tons	(-) 11.6	(-) 260.2	(-) 433.7	(-) 705.5
Fuel Needs	gallons	(+) 1.5	(-) 116.1	(-) 40.8	(-) 155.4
Amount of Herbicide Use	dollars	-	(-) 3.8	(+) 6.2	(+) 2.4
Amount of Pesticide Use	dollars	-	(+) 80.8	(+) 70.0	(+) 150.8
Fertilizer Needs					
N - Nitrogen	pounds	-	(-) 11.7	(-) 1.6	(-) 13.3
P - Phosphorus	pounds	-	(-) 217.9	(+) 310.6	(+) 92.7
K - Potassium	pounds	-	(-) 217.9	(+) 310.6	(+) 92.7
Amount of Wildlife Food and Cover	acres	-	-	-	-
SOCIAL WELL-BEING ACCOUNT		----------ACTUAL UNITS----------			
Employment					
On-Farm	man-years	(+) 0.2	(-) 17.7	(-) 4.3	(-) 22.0
Technical Assistance	man-years	(+) 0.8	(+) 2.7	(+) 0.3	(+) 3.8

1/ Crop production income is return over budgeted cost for major crops only. These include corn, silage, oats, hay, cropland pasture and managed and unmanaged permanent pasture.

The specified five percent reduction in total soil loss was achieved with a projected increase in income from the plan. Plan Areas 1 and 3 illustrate the expected result of soil loss reduction at an increased cost. Plan Area 2 overrides this effect with its increase in return over budgeted cost from major crop production. This impact occurs as an income increase because of some underlying assumptions made in setting up the analysis. Conservation tillage was assumed to have no direct cost except for some slight variations in input efficiency, no yield differentials were assumed for the various tillage practices, and yields were assumed to increase when soils were adequately treated. In this case, and for alternatives 5 and 6, these assumptions allowed the projected output in Plan Area 2 to be produced on less cropland acres, thus increasing return to major crop production. Table 4-8 shows that in Plan Area 2, the only projected input increase is amount of insecticide. Plan Area 3 projections show increases in herbicide and fertilizer use because of increased production acreage.

ALTERNATIVE 8

This plan was formulated as a comparison to alternative 7. The plan elements include increasing stripcropping and conservation tillage acres at the expense of conventional tillage and idle acres. The magnitude of these elements is shown in table 4-9.

The impact of these tillage changes is projected to decrease soil loss by 13 percent or 1,626,900 tons (1,475,900 tonnes); reduce cropland acres exceeding tolerance level by 149,000 acres (60,300 ha); and reduce cost about $6.3 million. The implementation cost would be nearly $3.8 million while the annual return over budgeted cost from major crop production is projected to decrease over $2.5 million. All production inputs increase except for fuel and labor in Plan Area 2.

ALTERNATIVE 9

Alternative 9 was formulated to evaluate the impact of competition for "prime" agricultural land. Ten percent or 82,550 acres (33,400 ha) of "prime" cropland soils (classes 1, 2e, and drained 2w) were removed from production as if they had been developed or utilized for some other purpose. This alternative was evaluated assuming the same production level as in alternative 1.

The impact of this "prime" cropland removal is projected to increase costs and soil loss and to decrease return over budgeted cost from major crop production, table 4-10. Maintaining production levels required the utilization of 126,250 (51,100 ha) idle cropland acres to replace the output lost by the removal of 82,550 acres (33,400 ha) "prime" cropland acres. This is because the idle acres are less productive than the "prime" acres. At the same time, acres exceeding soil loss tolerance were projected to decrease slightly.

Table 4-9

Alternative 8, 2000
Wisconsin River Basin

EFFECTS AND IMPACTS	UNITS	PLAN AREA 1	PLAN AREA 2	PLAN AREA 3	BASIN
LAND USE AND TILLAGE		----------1000 UNITS----------			
Cropland (Total)	acres	-	-	-	-
Conventional Tillage	acres	(-) 20.4	(-) 219.4	(-) 51.7	(-) 291.5
Contour Farming	acres	-	-	(+) 4.6	(+) 4.6
Strip Cropping	acres	(+) 22.6	(+) 125.6	(+) 144.3	(+) 292.5
Conservation Tillage	acres	-	(+) 127.4	-	(+) 127.4
Idle	acres	(-) 2.2	(-) 33.6	(-) 97.2	(-) 133.0
Pasture Land (Total)	acres	-	-	-	-
Managed	acres	-	-	-	-
Unmanaged	acres	-	(-) 0.4	(-) 87.3	(-) 87.7
Idle (Not Utilized)	acres	-	(+) 0.4	(+) 87.3	(+) 87.7
Forest Land (Total)	acres	-	-	-	-
Ungrazed	acres	-	-	-	-
Grazed	acres	-	-	-	-
NATIONAL ECONOMIC DEVELOPMENT ACCOUNT					
Income					
Crop Production (Major Crops) 1/	dollars	(-) 7.7	(-) 451.5	(-) 2,055.4	(-) 2,514.6
Other	dollars	-	-	-	-
Costs					
Installation					
Region	dollars	(+) 135.6	(+) 753.6	(+) 879.6	(+) 1,768.8
Rest of Nation	dollars	(+) 90.4	(+) 502.4	(+) 577.2	(+) 1,170.0
Technical Assistance					
Region	dollars	(+) 12.0	(+) 79.0	(+) 77.7	(+) 168.7
Rest of Nation	dollars	(+) 47.7	(+) 316.3	(+) 309.2	(+) 673.2
Total Costs					
Region	dollars	(+) 147.6	(+) 832.6	(+) 957.3	(+) 1,937.5
Rest of Nation	dollars	(+) 138.1	(+) 818.7	(+) 886.4	(+) 1,843.2
Net Effects	dollars	(-) 293.4	(-) 2,102.8	(-) 3,899.1	(-) 6,295.3
ENVIRONMENTAL QUALITY ACCOUNT					
Cropland Exceeding Soil Loss Tolerance	acres	-	(-) 70.6	(-) 78.4	(-) 149.0
Soil Loss (Cropland, Pasture & Forest)	tons	(-) 29.0	(-) 513.7	(-) 1,084.2	(-) 1,626.9
Fuel Needs	gallons	(+) 10.1	(-) 90.3	(+) 141.7	(+) 61.5
Amount of Herbicide Use	dollars	-	(+) 27.7	(+) 73.8	(+) 101.5
Amount of Pesticide Use	dollars	-	(+) 106.2	(+) 68.0	(+) 174.2
Fertilizer Needs					
N - Nitrogen	pounds	(+) 0.5	(+) 3.1	(+) 75.3	(+) 78.9
P - Phosphorus	pounds	(+) 88.7	(+) 1,348.3	(+) 3,984.8	(+) 5,421.8
K - Potassium	pounds	(+) 88.7	(+) 1,348.3	(+) 3,984.8	(+) 5,421.8
Amount of Wildlife Food and Cover	acres	-	-	-	-
SOCIAL WELL-BEING ACCOUNT		----------ACTUAL UNITS----------			
Employment					
On-Farm	man-years	(+) 1.6	(-) 13.4	(+) 21.4	(+) 9.6
Technical Assistance	man-years	(+) 3.6	(+) 23.8	(+) 23.2	(+) 50.6

1/ Crop production income is return over budgeted cost for major crops only. These include corn, silage, oats, hay, cropland pasture and managed and unmanaged permanent pasture.

Table 4-10

Alternative 9, 2000
Wisconsin River Basin

EFFECTS AND IMPACTS	UNITS	PLAN AREA 1	PLAN AREA 2	PLAN AREA 3	BASIN
LAND USE AND TILLAGE		----------1000 UNITS----------			
Cropland (Total)	acres	-	-	-	-
Conventional Tillage	acres	(+) 0.3	(+) 31.9	(+) 11.5	(+) 43.7
Contour Farming	acres	-	-	-	-
Strip Cropping	acres	-	-	-	-
Conservation Tillage	acres	-	-	-	-
Idle	acres	(-) 0.3	(-) 31.9	(-) 11.5	(-) 43.7
Pasture Land (Total)	acres	-	-	-	-
Managed	acres	-	-	-	-
Unmanaged	acres	-	(-) 0.4	(-) 6.0	(-) 6.4
Idle (Not Utilized)	acres	-	(+) 0.4	(+) 6.0	(+) 6.4
Forest Land (Total)	acres	-	-	-	-
Ungrazed	acres	-	-	-	-
Grazed	acres	-	-	-	-
NATIONAL ECONOMIC DEVELOPMENT ACCOUNT					
Income					
Crop Production (Major Crops) 1/	dollars	(-) 11.0	(-) 12.1	(-) 660.6	(-) 683.7
Other	dollars	-	-	-	-
Costs					
Installation					
Region	dollars	-	-	-	-
Rest of Nation	dollars	-	-	-	-
Technical Assistance					
Region	dollars	-	-	-	-
Rest of Nation	dollars	-	-	-	-
Total Costs					
Region	dollars	-	-	-	-
Rest of Nation	dollars	-	-	-	-
Net Effects	dollars	(-) 11.0	(-) 12.1	(-) 660.6	(-) 683.7
ENVIRONMENTAL QUALITY ACCOUNT					
Cropland Exceeding Soil Loss Tolerance	acres	-	-	(-) 18.3	(-) 18.3
Soil Loss (Cropland, Pasture & Forest)	tons	(+) 1.0	(-) 47.9	(+) 610.0	(+) 563.1
Fuel Needs	gallons	(+) 1.4	(+) 107.3	(+) 115.0	(+) 223.7
Amount of Herbicide Use	dollars	-	(+) 24.6	(+) 24.8	(+) 49.4
Amount of Pesticide Use	dollars	-	(+) 24.0	(+) 22.6	(+) 46.6
Fertilizer Needs					
N - Nitrogen	pounds	(+) 0.9	(+) 83.2	(+) 19.8	(+) 103.9
P - Phosphorus	pounds	(+) 13.3	(+) 1,321.6	(+) 540.1	(+) 1,875.0
K - Potassium	pounds	(+) 13.3	(+) 1,321.6	(+) 540.1	(+) 1,875.0
Amount of Wildlife Food and Cover	acres	-	-	-	-
SOCIAL WELL-BEING ACCOUNT		----------ACTUAL UNITS----------			
Employment					
On-Farm	man-years	(+) 0.2	(+) 15.7	(+) 15.4	(+) 31.3
Technical Assistance	man-years	-	-	-	-

1/ Crop production income is return over budgeted cost for major crops only. These include corn, silage, oats, hay, cropland pasture and managed and unmanaged permanent pasture.

This indicates that a conservation program based solely on "acres needing treatment" may not have the desired effect of reducing soil loss, particularly if production levels are maintained or expanded. The total increased soil loss from cropping idle acres to maintain production levels could easily be greater than that saved by such a program.

COMPARISON OF ALTERNATIVES

In order to facilitate the comparison of alternatives, a table was developed containing all nine alternatives for each plan area and the Basin. Tables 4-11, 4-12, 4-13, and 4-14 give the level of impact of Alternative 1 - Continue Present Trends, to the year 2000. The other alternatives are shown as the magnitude of change from alternative 1 at the same time period. For example, the return over budgeted cost from major crop production in Plan Area 1 is projected to be nearly $4.6 million in 2000 (alternative 1), table 4-11. The largest projected increase is $1.4 million in alternative 2 and the greatest decrease is $66,800 in alternative 3. Thus the total amount for alternative 2 would be $6 million, the $4.6 million from alternative 1 plus the $1.4 million additional from alternative 2.

In Plan Area 2 the cropland exceeding soil loss tolerance is projected to be 186,300 acres (75,400 ha) in the year 2000 for alternative 1, table 4-12. Given alternative 4, there is an additional projected increase of 32,500 acres (13,200 ha) for an actual total of 218,800 acres (88,500 ha). Alternative 8 is projected to decrease 70,600 acres (28,600 ha) from the alternative 1 level, for a total of 115,700 acres (46,800 ha).

Plan Area 3 is projected to have 7,481,500 tons (6,787,200 tonnes) of soil loss from cropland, pasture, and forest in the year 2000, assuming the continuation of present trends, table 4-13. Alternative 2, shows a projected increase of 4,405,100 tons (3,996,300 tonnes) from this level for an actual level of 11,886,600 tons (10,783,500 tonnes). The largest projected decrease is 2,597,900 tons (2,356,800 tonnes) from alternative 3 for an actual level of 4,883,600 tons (4,430,400 tonnes).

Table 4-11

Comparison of Alternatives, 2000 - Plan Area 1
Wisconsin River Basin

EFFECTS AND IMPACTS	UNITS	ALTERNATIVES								
		#1 CONTINUE PRESENT TRENDS	#2 NED	#3 EQ	#4	#5	#6	#7	#8	#9
LAND USE AND TILLAGE		1000 UNITS								
Cropland (Total)	acres	89.3	-	-	-	-	-	-	-	-
Conventional Tillage	acres	52.8	(+) 13.3	(-) 2.5	(+) 0.9	(-) 0.4	(-) 1.8	(-) 7.7	(-) 20.4	(+) 0.3
Contour Farming	acres	0.3	-	(+) 0.4	(-) 0.2	-	(+) 0.3	(+) 5.1	-	-
Contour Strip Cropping	acres	0.9	-	(+) 1.0	(-) 0.7	(+) 0.2	(+) 0.8	(+) 2.6	(+) 22.6	-
Conservation Tillage	acres	-	-	(+) 1.2	-	(+) 0.2	(+) 0.8	-	-	-
Idle	acres	35.3	(-) 13.3	(-) 0.1	-	-	(-) 0.1	-	(-) 2.2	(-) 0.3
Pasture Land (Total)	acres	80.8	-	-	-	-	-	-	-	-
Managed	acres	3.0	(+) 6.0	(+) 5.3	-	-	-	-	-	-
Unmanaged	acres	-	-	-	-	-	-	-	-	-
Idle (Not Utilized)	acres	77.8	(-) 6.0	(-) 5.3	-	-	-	-	-	-
Forest Land (Total)	acres	1,349.5	-	-	-	-	-	-	-	-
Grazed	acres	30.7	-	(-) 21.5	-	-	-	-	-	-
Ungrazed	acres	1,318.8	-	(+) 21.5	-	-	-	-	-	-
Wetland - Types 3-8	acres	439.6	-	(+) 2.2	-	-	-	-	-	-
NATIONAL ECONOMIC DEVELOPMENT ACCOUNT										
Income										
Crop Production (Major Crops) 1/	dollars	4,564.1	(+) 1,353.5	(-) 66.8	(+) 2.2	(-) 0.1	(-) 1.9	(-) 10.9	(-) 7.7	(-) 11.0
Other	dollars	-	-	-	-	-	-	-	-	-
Costs										
Installation										
Region	dollars	-	(+) 105.0	(+) 2,650.2	-	(+) 0.6	(+) 4.1	(+) 30.9	(+) 135.6	-
Rest of Nation	dollars	-	(+) 45.0	(+) 604.0	-	-	(+) 4.8	(+) 10.4	(+) 90.4	-
Technical Assistance										
Region	dollars	-	(+) 0.2	(+) 57.2	-	(+) 0.1	(+) 0.6	(+) 2.7	(+) 12.0	-
Rest of Nation	dollars	-	(+) 0.4	(+) 82.3	-	(+) 0.3	(+) 2.3	(+) 10.7	(+) 47.7	-
Total Costs										
Region	dollars	-	(+) 105.2	(+) 2,707.4	-	(+) 0.7	(+) 4.7	(+) 33.6	(+) 147.6	-
Rest of Nation	dollars	-	(+) 45.4	(+) 686.3	-	(+) 0.3	(+) 7.1	(+) 21.1	(+) 138.1	-
Net Effects	dollars	4,564.1	(+) 1,202.9	(-) 3,460.5	(+) 2.2	(-) 1.1	(-) 13.7	(-) 65.6	(-) 293.4	(-) 11.0
ENVIRONMENTAL QUALITY ACCOUNT										
Cropland Exceeding Soil Loss Tolerance	acres	1.3	-	-	-	-	-	-	-	-
Soil Loss (Cropland, Pasture and Forest)	tons	738.3	(+) 5.1	(-) 148.4	(+) 0.4	(-) 0.5	(-) 1.6	(-) 11.6	(-) 29.0	(+) 1.0
Fuel Needs	gallons	242.4	(+) 85.1	(-) 0.2	(-) 0.2	(-) 0.1	(-) 0.3	(+) 1.5	(+) 10.1	(+) 1.4
Amount of Herbicide Use	dollars	-	-	-	-	-	-	-	-	-
Amount of Pesticide Use	dollars	18.5	(+) 6.3	(+) 0.8	-	(+) 0.1	(+) 0.6	-	-	-
Fertilizer Needs										
N - Nitrogen	pounds	145.9	(+) 39.8	(-) 0.3	(-) 0.1	-	(-) 0.1	-	(+) 0.5	(+) 0.9
P - Phosphorus	pounds	2,122.8	(+) 580.7	(-) 3.7	(-) 1.2	-	(+) 2.5	-	(+) 88.7	(+) 13.3
K - Potassium	pounds	2,122.8	(+) 580.7	(-) 3.7	(-) 1.2	-	(+) 2.5	-	(+) 88.7	(+) 13.3
Amount of Wildlife Food & Cover	acres	-	-	(+) 8.0	-	-	-	-	-	-
SOCIAL WELL-BEING ACCOUNT		ACTUAL UNITS								
Employment										
On-Farm	man-years	39.2	(+) 13.6	(-) 0.1	(-) 0.1	(-) 0.4	(-) 0.1	(+) 0.2	(+) 1.6	(+) 0.2
Technical Assistance	man-years	-	(+) 0.1	(+) 1.4	-	(+) 0.1	(+) 0.2	(+) 0.8	(+) 3.6	-

1/ Crop production income is return over budgeted cost for major crops only. These include corn, silage, oats, hay, cropland pasture and managed and unmanaged permanent pasture.

Table 4-12

Comparison of Alternatives, 2000 - Plan Area 2
Wisconsin River Basin

EFFECTS AND IMPACTS	UNITS	ALTERNATIVES								
		#1 CONTINUE PRESENT TRENDS	#2 NED	#3 EQ	#4	#5	#6	#7	#8	#9
LAND USE AND TILLAGE		1000 UNITS								
Cropland (Total)	acres	1,109.4	-	(-) 1.0	-	(-) 0.2	(-) 0.7	-	-	-
Conventional Tillage	acres	585.7	(+) 265.5	(-) 40.9	(-) 14.2	(-) 5.8	(-) 27.5	(-) 168.4	(-) 219.4	(+) 31.9
Contour Farming	acres	24.6	-	(+) 6.1	(-) 19.2	(+) 0.9	(+) 4.3	(+) 35.7	-	-
Contour Strip Cropping	acres	95.6	-	(+) 17.7	(-) 75.0	(+) 2.5	(+) 12.7	-	(+) 125.6	-
Conservation Tillage	acres	75.0	-	(+) 19.0	(+) 95.0	(+) 2.7	(+) 13.6	(+) 127.4	(+) 127.4	-
Idle	acres	328.5	(-) 265.5	(-) 2.9	(+) 13.4	(-) 0.5	(-) 3.8	(+) 5.3	(-) 33.6	(-) 31.9
Pasture Land (Total)	acres	448.9	-	(+) 1.0	-	(+) 0.2	(+) 0.7	-	-	-
Managed	acres	39.8	-	(+) 31.4	-	(-) 1.5	(-) 9.8	-	-	-
Unmanaged	acres	0.4	(+) 118.6	(-) 0.4	(+) 34.9	(-) 0.4	(-) 0.4	(+) 0.3	(-) 0.4	(-) 0.4
Idle (Not Utilized)	acres	408.7	(-) 118.6	(-) 29.9	(-) 34.9	(+) 2.2	(+) 10.9	(-) 0.3	(+) 0.4	(+) 0.4
Forest Land (Total)	acres	1,403.0	-	-	-	-	-	-	-	-
Grazed	acres	261.9	-	(-) 183.3	-	-	-	-	-	-
Ungrazed	acres	1,141.1	-	(+) 183.3	-	-	-	-	-	-
Wetland - Types 3-8	acres	198.4	-	(+) 4.1	-	-	-	-	-	-
NATIONAL ECONOMIC DEVELOPMENT ACCOUNT										
Income										
Crop Production (Major Crops) 1/	dollars	90,336.8	(+) 20,360.9	(-) 407.9	(+) 258.6	(+) 17.5	(+) 109.9	(+) 325.9	(-) 451.5	(-) 12.1
Other	dollars	-	-	-	-	-	-	-	-	-
Costs										
Installation										
Region	dollars	-	-	(+) 18,152.9	-	(+) 81.1	(+) 405.0	(+) 107.1	(+) 753.6	-
Rest of Nation	dollars	-	-	(+) 6,332.8	-	(+)263.4	(+)1,353.9	-	(+) 502.4	-
Technical Assistance										
Region	dollars	-	-	(+) 1,066.9	(+) 2.4	(+) 5.9	(+) 29.5	(+) 9.1	(+) 79.0	-
Rest of Nation	dollars	-	-	(+) 1,294.5	(+) 45.1	(+) 23.5	(+) 117.7	(+) 36.6	(+) 316.3	-
Total Costs										
Region	dollars	-	-	(+) 19,219.8	(+) 2.4	(+) 87.0	(+) 434.5	(+) 116.2	(+) 832.6	-
Rest of Nation	dollars	-	-	(+) 7,627.3	(+) 45.1	(+)286.9	(+)1,471.6	(+) 36.6	(+) 818.7	-
Net Effects	dollars	90,336.8	(+) 20,360.9	(-) 27,255.0	(+) 211.1	(-)356.4	(-)1,796.2	(+) 173.1	(-) 2,102.8	(-) 12.1
ENVIRONMENTAL QUALITY ACCOUNT										
Cropland Exceeding Soil Loss Tolerance	acres	186.3		(-) 31.1	(+) 32.5	(-) 5.5	(-) 27.3	(-) 20.8	(-) 70.6	-
Soil Loss (Cropland, Pasture and Forest)	tons	4,639.9	(+) 700.4	(-) 1,446.2	(-) 1.5	(-) 26.2	(-) 152.8	(-) 260.2	(-) 513.7	(-) 47.9
Fuel Needs	gallons	4,692.8	(+) 2,105.7	(-) 37.8	(-) 65.1	(-) 6.1	(-) 35.6	(-) 116.1	(-) 90.3	(+) 107.3
Amount of Herbicide Use	dollars	760.1	(+) 297.2	(-) 10.4	(-) 10.6	(-) 1.4	(-) 6.2	(-) 3.8	(+) 27.7	(+) 24.6
Amount of Pesticide Use	dollars	1,827.3	(+) 641.4	(-) 42.0	(+) 45.2	(-) 5.6	(-) 26.8	(+) 80.8	(+) 106.2	(+) 24.0
Fertilizer Needs										
N - Nitrogen	pounds	1,923.9	(+) 725.4	(+) 5.6	(+) 10.2	(+) 0.4	(+) 2.4	(-) 11.7	(+) 3.1	(+) 83.2
P - Phosphorus	pounds	29,203.8	(+) 10,787.2	(+) 109.0	(-) 531.2	(+) 17.9	(+) 147.6	(-) 217.9	(+) 1,348.3	(+) 1,321.6
K - Potassium	pounds	29,203.8	(+) 10,787.2	(+) 109.0	(-) 531.2	(+) 17.9	(+) 147.6	(-) 217.9	(+) 1,348.3	(+) 1,321.6
Amount of Wildlife Food & Cover	acres	-	-	(+) 20.0	-	-	-	-	-	-
SOCIAL WELL-BEING ACCOUNT		ACTUAL UNITS								
Employment										
On-Farm	man-years	693.1	(+) 312.2	(-) 5.5	(-) 10.2	(-) 0.9	(-) 5.1	(-) 17.7	(-) 13.4	15.7
Technical Assistance	man-years	-	-	(+) 6.3	(+) 2.9	(+) 1.8	(+) 8.9	(+) 2.7	(+) 23.8	(+) -

1/ Crop production income is return over budgeted cost for major crops only. These include corn, silage, oats, hay, cropland pasture and managed and unmanaged permanent pasture.

Table 4-13

Comparison of Alternatives, 2000 - Plan Area 3
Wisconsin River Basin

EFFECTS AND IMPACTS	UNITS	ALTERNATIVES								
		#1 CONTINUE PRESENT TRENDS	#2 NED	#3 EQ	#4	#5	#6	#7	#8	#9
LAND USE AND TILLAGE		1000 UNITS								
Cropland (Total)	acres	1,288.5	-	(-) 6.6	-	(-) 0.9	(-) 4.7	-	-	-
Conventional Tillage	acres	217.5	(+) 223.1	(-) 60.1	(+) 130.5	(-) 12.0	(-) 41.6	(-) 27.8	(-) 51.7	(+) 11.5
Contour Farming	acres	117.2	-	(+) 16.0	(-) 92.0	(+) 2.3	(+) 11.4	(+) 4.0	(+) 4.6	-
Contour Strip Cropping	acres	340.9	-	(+) 47.9	(-) 268.0	(+) 6.9	(+) 34.2	-	(+) 144.3	-
Conservation Tillage	acres	170.0	-	(+) 49.9	(+) 180.0	(+) 7.1	(+) 35.7	(+) 31.6	-	-
Idle	acres	441.9	(-) 223.1	(-) 60.3	(+) 49.5	(-) 5.2	(-) 44.4	(-) 7.8	(-) 97.2	(-) 11.5
Pasture Land (Total)	acres	473.7	-	(+) 6.6	-	(+) 0.9	(+) 4.7	-	-	-
Managed	acres	64.0	-	(+) 19.4	-	(+) 0.8	(-) 7.7	-	-	-
Unmanaged	acres	87.3	(+) 185.3	(-) 87.3	(+) 94.6	(-) 15.5	(-) 87.3	(-) 15.0	(-) 87.3	(-) 6.0
Idle (Not Utilized)	acres	322.4	(-) 185.3	(+) 74.6	(-) 94.6	(+) 15.5	(+) 99.8	(+) 15.0	(+) 87.3	(+) 6.0
Forest Land (Total)	acres	697.2	-	-	-	-	-	-	-	-
Grazed	acres	346.2	-	(-) 242.3	-	-	-	-	-	-
Ungrazed	acres	351.0	-	(+) 242.3	-	-	-	-	-	-
Wetland - Types 3-8	acres	53.4	-	(+) 0.5	-	-	-	-	-	-
NATIONAL ECONOMIC DEVELOPMENT ACCOUNT										
Income										
Crop Production (Major Crops) 1/	dollars	153,943.9	(+) 42,871.6	(-) 5,951.1	(+) 1,361.7	(-) 620.2	(-) 3,588.3	(-) 21.7	(-) 2,055.4	(-) 660.6
Other	dollars	-	-	-	-	-	-	-	-	-
Costs										
Installation										
Region	dollars	-	-	(+) 23,945.8	-	(+) 113.7	(+) 594.7	(+) 12.0	(+) 879.6	-
Rest of Nation	dollars	-	-	(+) 17,162.6	-	(+) 358.2	(+) 1,654.5	-	(+) 577.2	-
Technical Assistance										
Region	dollars	-	-	(+) 2,194.4	(+) 6.3	(+) 9.9	(+) 31.9	(+) 1.0	(+) 77.7	-
Rest of Nation	dollars	-	-	(+) 3,602.5	(+) 83.7	(+) 40.1	(+) 127.6	(+) 4.1	(+) 309.2	-
Total Costs										
Region	dollars	-	-	(+) 26,140.2	(+) 6.3	(+) 123.6	(+) 626.6	(+) 13.0	(+) 957.3	-
Rest of Nation	dollars	-	-	(+) 20,765.1	(+) 83.7	(+) 398.3	(+) 1,782.1	(+) 4.1	(+) 886.4	-
Net Effects	dollars	153,943.9	(+) 42,871.6	(-) 52,856.4	(+) 1,271.7	(-) 1,142.1	(-) 5,997.0	(-) 38.8	(-) 3,899.1	(-) 660.6
ENVIRONMENTAL QUALITY ACCOUNT										
Cropland Exceeding Soil Loss Tolerance	acres	482.7	(-) 17.9	(-) 95.0	(+) 31.8	(-) 13.2	(-) 54.2	(+) 11.3	(-) 78.4	(-) 18.3
Soil Loss (Cropland, Pasture and Forest)	tons	7,481.5	(+) 4,405.1	(-) 2,597.9	(+) 1,995.4	(-) 292.7	(-) 698.5	(-) 433.7	(-) 1,084.2	(+) 610.0
Fuel Needs	gallons	5,798.9	(+) 2,297.4	(-) 108.7	(-) 338.9	(-) 35.0	(-) 110.1	(-) 40.8	(+) 141.7	(+) 115.0
Amount of Herbicide Use	dollars	1,341.3	(+) 448.4	(-) 22.8	(-) 38.6	(-) 8.3	(-) 20.3	(+) 6.2	(+) 73.8	(+) 24.8
Amount of Pesticide Use	dollars	3,274.5	(+) 941.4	(-) 95.6	(+) 272.5	(-) 10.2	(-) 77.6	(+) 70.0	(+) 68.0	(+) 22.6
Fertilizer Needs										
N - Nitrogen	pounds	1,833.4	(+) 468.4	(+) 118.5	(-) 5.0	(+) 16.1	(+) 75.0	(-) 1.6	(+) 75.3	(+) 19.8
P - Phosphorus	pounds	35,926.4	(+) 10,497.7	(+) 2,109.4	(-) 1,981.9	(+) 158.5	(+) 1,530.8	(+) 310.6	(+) 3,984.8	(+) 540.1
K - Potassium	pounds	35,926.4	(+) 10,497.7	(+) 2,109.4	(-) 1,981.9	(+) 158.5	(+) 1,530.8	(+) 310.6	(+) 3,984.8	(+) 540.1
Amount of Wildlife Food & Cover	acres	-	-	(+) 20.0	-	-	-	-	-	-
SOCIAL WELL-BEING ACCOUNT		ACTUAL UNITS								
Employment										
On-Farm	man-years	813.1	(+) 322.8	(-) 13.1	(-) 44.4	(-) 4.5	(-) 13.4	(-) 4.3	(+) 21.4	(+) 15.4
Technical Assistance	man-years	-	-	(+) 21.2	(+) 5.5	(+) 3.0	(+) 9.6	(+) 0.3	(+) 23.2	-

1/ Crop production income is return over budgeted cost for major crops only. These include corn, silage, oats, hay, cropland pasture and managed and unmanaged permanent pasture.

Table 4-14

Comparison of Alternatives, 2000 - Basin
Wisconsin River Basin

EFFECTS AND IMPACTS	UNITS	ALTERNATIVES								
		#1 CONTINUE PRESENT TRENDS	#2 NED	#3 EQ	#4	#5	#6	#7	#8	#9
LAND USE AND TILLAGE		1000 UNITS								
Cropland (Total)	acres	2,486.2	-	(-) 7.6	-	(-) 1.1	(-) 5.4	-	-	-
Conventional Tillage	acres	856.0	(+) 501.9	(-) 103.5	(+) 117.2	(-) 18.2	(-) 70.9	(-) 203.9	(-) 291.5	(+) 43.7
Contour Farming	acres	142.1	-	(+) 22.5	(-) 111.4	(+) 3.2	(+) 16.0	(+) 44.8	(+) 4.6	-
Contour Strip Cropping	acres	437.4	-	(+) 66.6	(-) 343.7	(+) 9.6	(+) 47.7	(+) 2.6	(+) 292.5	-
Conservation Tillage	acres	245.0	-	(+) 70.1	(+) 275.0	(+) 10.0	(+) 50.1	(+) 159.0	(+) 127.4	-
Idle	acres	805.7	(-) 501.9	(-) 63.3	(+) 62.9	(-) 5.7	(-) 48.3	(-) 2.5	(-) 133.0	(-) 43.7
Pasture Land (Total)	acres	1,003.4	-	(+) 7.6	-	(+) 1.1	(+) 5.4	-	-	-
Managed	acres	106.8	(+) 6.0	(+) 56.1	-	(-) 0.7	(-) 17.5	-	-	-
Unmanaged	acres	87.7	(+) 303.9	(-) 87.7	(+) 129.5	(-) 15.9	(-) 87.7	(-) 14.7	(-) 87.7	(-) 6.4
Idle (Not Utilized)	acres	808.9	309.9	(+) 39.4	(-) 129.5	(+) 17.7	(+) 110.7	(+) 14.7	(+) 87.7	(+) 6.4
Forest Land (Total)	acres	3,449.7	-	-	-	-	-	-	-	-
Grazed	acres	638.8	-	(-) 447.1	-	-	-	-	-	-
Ungrazed	acres	2,810.9	-	(+) 447.1	-	-	-	-	-	-
Wetland - Types 3-8	acres	691.4	-	(+) 6.8	-	-	-	-	-	-
NATIONAL ECONOMIC DEVELOPMENT ACCOUNT										
Income										
Crop Production (Major Crops) 1/	dollars	248,844.8	(+) 64,586.0	(-) 6,425.8	(+) 1,622.5	(-) 602.8	(-) 3,480.3	(+) 293.3	(-) 2,514.6	(-) 683.7
Other	dollars	-	-	-	-	-	-	-	-	-
Costs										
Installation										
Region	dollars	-	(+) 105.0	(+) 44,748.9	-	(+) 195.4	(+) 1,003.8	(+) 150.0	(+) 1,768.8	-
Rest of Nation	dollars	-	(+) 45.0	(+) 24,099.4	-	(+) 621.6	(+) 3,013.2	(+) 10.4	(+) 1,170.0	-
Technical Assistance										
Region	dollars	-	(+) 0.2	(+) 3,518.5	(+) 8.7	(+) 15.9	(+) 62.0	(+) 12.8	(+) 168.7	-
Rest of Nation	dollars	-	(+) 0.4	(+) 4,979.3	(+) 128.8	(+) 63.9	(+) 247.6	(+) 51.4	(+) 673.2	-
Total Costs										
Region	dollars	-	(+) 105.2	(+) 48,067.4	(+) 8.7	(+) 211.3	(+) 1,065.8	(+) 162.8	(+) 1,937.5	-
Rest of Nation	dollars	-	(+) 45.4	(+) 29,078.7	(+) 128.8	(+) 685.5	(+) 3,206.8	(+) 61.8	(+) 1,843.2	-
Net Effects	dollars	248,844.8	(+) 64,435.4	(-) 83,571.9	(+) 1,485.0	(-) 1,499.6	(-) 7,806.9	(+) 68.7	(-) 6,295.3	(-) 683.7
ENVIRONMENTAL QUALITY ACCOUNT										
Cropland Exceeding Soil Loss Tolerance	acres	670.3	(-) 17.9	(-) 126.1	(+) 64.3	(-) 18.7	(-) 81.5	(-) 9.5	(-) 149.0	(-) 18.3
Soil Loss (Cropland, Pasture and Forest)	tons	12,859.7	(+) 5,110.6	(-) 4,192.5	(+) 1,994.3	(-) 319.4	(-) 852.9	(-) 705.5	(-) 1,626.9	(+) 563.1
Fuel Needs	gallons	10,734.1	(+) 4,488.2	(-) 146.7	(-) 404.2	(-) 41.2	(-) 146.0	(-) 155.4	(+) 61.5	(+) 223.7
Amount of Herbicide Use	dollars	2,101.4	(+) 745.6	(-) 33.2	(-) 49.2	(-) 9.7	(-) 26.5	(+) 2.4	(+) 101.5	(+) 49.4
Amount of Pesticide Use	dollars	5,120.3	(+) 1,589.1	(-) 136.8	(+) 317.7	(-) 15.7	(-) 103.8	(+) 150.8	(+) 174.2	(+) 46.6
Fertilizer Needs										
N - Nitrogen	pounds	3,903.2	(+) 1,233.6	(+) 123.8	(+) 5.1	(+) 16.5	(+) 77.3	(-) 13.3	(+) 78.9	(+) 103.9
P - Phosphorus	pounds	67,253.0	(+) 21,865.6	(+) 2,214.7	(-) 2,514.3	(+) 176.4	(+) 1,680.9	(+) 92.7	(+) 5,421.8	(+) 1,875.0
K - Potassium	pounds	67,253.0	(+) 21,865.6	(+) 2,214.7	(-) 2,514,3	(+) 176.4	(+) 1,680.9	(+) 92.7	(+) 5,421.8	(+) 1,875.0
Amount of Wildlife Food & Cover	acres	-	-	(+) 48.0	-	-	-	-	-	-
SOCIAL WELL-BEING ACCOUNT		ACTUAL UNITS								
Employment										
On-Farm	man-years	1,545.4	(+) 648.6	(-) 18.7	(-) 54.7	(-) 5.8	(-) 18.6	(-) 22.0	(+) 9.6	(+) 31.3
Technical Assistance	man-years	-	(+) 0.1	(+) 28.9	(+) 8.4	(+) 4.9	(+) 18.7	(+) 3.8	(+) 50.6	-

1/ Crop production income is return over budgeted cost for major crops only. These include corn, silage, oats, hay, cropland pasture and managed and unmanaged permanent pasture.

CHAPTER V
OPPORTUNITIES FOR IMPLEMENTATION

CHAPTER 5

OPPORTUNITIES FOR IMPLEMENTATION

This chapter discusses opportunities for implementing the alternatives, except for the alternative of taking prime agricultural land out of production. Any alternative or its component parts could be implemented with existing Federal and/or State authorities. However, a preferred or recommended alternative for implementation was not selected. Implementation of the environmental quality (EQ) plan will be discussed since this alternative encompasses to varying degrees the component parts or plan elements of each of the other alternatives. Table 5-1 lists the programs and authorities for implementing each alternative. The table also identifies agencies or organizations that could assist with implementation. A discussion of agency programs is included.

The initiative required for using Federal or State program resources to solve problems or meet anticipated needs generally rests with the residents or landowners in the Basin. Desired actions or goals (alternatives or component parts) will be included in USDA annual plans of operation and multiple-year plans. The Soil Conservation Service (SCS) program in Wisconsin will be directed to erosion control, water quality, land use, and assisting Indians and small farmers. A program to inform the public about the assistance available from USDA agencies will continue in order that Basin residents may select the combination of action programs that best meet their needs and desires.

Several means of implementing the EQ plan exists. However, this discussion will be generally limited to how USDA could assist with implementation of the plan elements. The USDA, through the SCS, Agricultural Stabilization and Conservation Service (ASCS), and the Farmers Home Administration (FmHA), provides technical and financial assistance to landowners and operators for the following elements:

1. Accelerate planning and application of conservation measures at a high rate.

2. Establish wildlife food and cover.

3. Protect shorelines and streambanks.

The installation, operation, and maintenance of these plan elements will be done by landowners or operators.

The removal of livestock from forest land can be implemented through cooperative forestry programs. Wisconsin Department of Natural Resources (DNR) county foresters will provide technical assistance in the form of a forestry management plan with livestock exclusion as a plan measure. The landowner

TABLE 5-1 - USDA AND OTHER PROGRAMS TO IMPLEMENT THE ALTERNATIVE PLANS
Wisconsin River Basin

ALTERNATIVE PLAN(S)	PROJECT, MEASURE, OR ACTION	PROGRAM AND AUTHORITY		FINANCIAL CAPABILITIES	LEGAL OR INSTITUTIONAL CONSTRAINTS
		USDA	OTHER		
1 - Continue Present Trends	Maintain current programs at present levels	Soil Conservation Service (SCS) Conservation Operations (CO) Program PL 74-46 Resource Conservation and Development Program, PL 74-46; PL 91-343; PL 87-703; and PL 97-415; Watershed Protection and Flood Prevention Act PL 83-566 Agricultural Stabilization and Conservation Service (ASCS), Agricultural Conservation Program (ACP), Emergency Conservation Measures (ECM), Forest Incentive Program (FIP) PL 74-46; PL 85-58; and PL 93-86 Cooperative Extension Service (CES), Information Program, Smith-Lever Act of 1914 Farmers Home Administration (FmHA), Grant and Loan Programs, PL 92-419, as amended; PL 94-68; PL 98-89; PL 89-117; PL 89-754; PL 83-566; PL 87-128; PL 87-703; PL 90-448; PL 91-229; PL 92-310; PL 93-351, as amended; PL 94-35 and PL 94-517 Forest Service (FS), Cooperative Forestry Programs (CFP) Administered by the Wisconsin Department of Natural Resources (WDNR), PL 95-313	Wisconsin Board of Soil and Water Conservation (BSWCD) and Local County Soil and Water Conservation Districts (SWCD), Wisconsin State Soil and Water Conservation District Law (WSWCD Law) C 92 Stats WDNR, Technical Assistance and Cooperative Programs - C 23; 29, 28; 1; 15; 16; 20; 26; 30; 31; 59; 60; 66; 70; 87; 88; 107; 144; and 147 Stats	Generally Adequate	None
2 - National Economic Development (NED) Plan	Increase income by bringing idle cropland into production and utilizing idle pasture land	SCS, CO, PL 74-46	BSWCD and Local County SWCD, On-going Programs, WSWCD Law, C 92 Stats	Adequate	Environmental Concerns May Limit Potential
3 - Environmental Quality (EQ) Plan	Accelerate planning and application of conservation measures at a high rate	SCS, CO, PL 74-46 ASCS, ACP, PL 74-46	BSWCD and Local County SWCD, On-going Programs, WSWCD Law C 92 Stats	Generally Inadequate	None
	Remove livestock from forest land	FS, CFP Administered by WDNR, PL 95-313 SCS, CO Program, PL 74-46 ASCS, ACP and FIP, PL 74-46; PL 93-86	BSWCD and Local SWCD, WSWCD Law C 92 Stats WDNR, Technical Assistance and Cooperative Programs, C 20; 28; 23; et. al. Stats	Inadequate	Historic Use Patterns
	Preserve existing wildlife habitat and open space by acquisition of type 3-8 wetlands	ASCS, Water Bank Act, PL 91-559	U.S. Fish & Wildlife Service (FWS), Daingell-Johnson (DJ) and Pittman-Robertson (PR) Programs, Fish and Wildlife Coordination Act, PL 85-624, as amended; Fish and Wildlife Act of 1956; Sport Fish Restoration Act of 1950; Wildlife Restoration Act of 1937; Endangered Species Act of 1973, PL 93-205 Heritage Conservation and Recreation Service (HCRS), Land Acquisition Programs, Land and Water Conservation Act of 1965 National Wild and Scenic Rivers System, PL 90-542 State of Wisconsin - WDNR, Land Acquisition, Gift of Lands, Gift of Lands in Trust C 23, 27, 28, 29 and 59 Stats Local County or Community Programs	Inadequate	Historic Use Patterns
	Establish exhibits identifying wetland types 3-8 and their values	CES, Information Program, Smith-Lever Act of 1914 SCS, CO, PL 74-46	FWS, Wildlife Technical Assistance, PL 85-624, as amended WDNR, Resource Management and Technical Assistance Programs C 23, et. al. Stats Local Community or County Programs	Adequate, but not specifically provided for	None
	Establish wildlife food and cover	SCS, CO Program, PL 74-46 ASCS, ACP, PL 74-46	Local County SWCD, WSWCD Law C 92 Stats WDNR, Technical Assistance and Cooperative Programs, C 23, 28, 20, et. al. Stats	Adequate	None
	Protect Shoreline and Streambanks	SCS, CO Program, PL 74-46 ASCS, ACP, PL 74-46	Local County SWCD, WSWCD Law C 92 Stats WDNR, Technical Assistance and Cooperative Programs, C 20, 23, 30, 31, 87 et. al. Stats	Inadequate	Historic Use Patterns
	Develop flood plain management programs	SCS, Flood Plain Management Assistance Program, PL 83-566 PL 93-234	WDNR, Flood Control Act, C 87 Stats Flood Insurance Administration (FIA), Flood Insurance Program, Flood Disaster Act of 1973, PL 93-234 Corps of Engineers, Flood Plain Manamement Services, Flood Control Act of 1960, as amended, PL 86-645 PL 93-234 U.S. Geological Survey (USGS) Act of March 3, 1879; PL 93-234	Adequate	Historic Use Patterns
4 - Increase Income by Reducing Crop Production Costs	Change tillage practices to reduce cost of production	SCS, CO Program, PL 74-46 ASCS, ACP, PL 74-46 CES, Information Program	Local County SWCD, WSWCD Law C 92 Stats	Adequate	Environmental Concerns May Limit Potential
5 & 6 - Accelerate Land Treatment at Low and Moderate Rates, Respectively	Reduce soil loss by accelerating the rate of planning and application of conservation measures	SCS, CO Program, PL 74-46 ASCS, ACP, PL 74-46 CES, Information Program	BSWCD and Local County SWCD, On-going and County Cost Share Programs, WSWCD Law, C 92 Stats	May Be Inadequate	None
7 & 8 - Reduce Soil Loss by a Specified Rate	Reduce sheet and rill soil loss by changing rotations and tillage practices	SCS, CO Program, Rural Clean Water Program (RCWP), PL 74-46; PL 95-217 ASCS, ACP, RCWP, PL 74-46; PL 95-217 CES, Information Program	U.S. Environmental Protection Agency (EPA), Nonpoint Source Water Pollution Control, PL 92-500 WDNR, BSWCD, and Local County SWCD's, Nonpoint Source Water Abatement Program.C 144 Stats BSWCD and Local County SWCD's, WSWCD Law, C 92 Stats	May Be Inadequate	Historic Use Patterns

installs the measure (usually a fencing practice) and may obtain financial assistance.

USDA could assist with the preserve existing wildlife habitat and open spaces plan element by providing project grants, advisory services, and counseling. In designated areas, USDA can make agreements for 10 years with eligible landowners to help preserve important migratory waterfowl nesting and breeding areas.

USDA could assist with the establishment of exhibits identifying types 3 through 8 wetlands and their values by providing technical assistance to sponsors of these undertakings.

In cooperation with Wisconsin DNR, SCS will, for local units of government, make flood hazard studies and, upon completion of flood hazard studies, help implement local flood plain management programs. In many cases, flood plain ordinances required by State and Federal regulations might suffice as a flood plain management plan. See appendix D for more information on flood plain management.

This study has already assisted in the implementation of some solutions or programs for identified problems or needs. For example, a computer program called Wise Land Use (WLU) developed to analyze land use, soil loss from sheet and rill erosion, and land treatment status for the Basin was one of the tools used to identify priority watersheds for the Areawide Water Quality Management Planning Process (Section 208, Public Law 92-500) and Wisconsin's Non-Point Source Water Pollution Abatement Program. Information developed for the 15 Basin counties was furnished to the State agencies involved. The WLU program was used to evaluate information for the other 57 counties in the State. A flood hazard study for Crooked and Sanders Creeks in Grant County was completed. The City of Boscobel will use the study to implement a flood plain management program. A standard base, utilizing a coordinate system for identifying river miles locations was accomplished during the study. Some information developed for this study was utilized in the Lower Wisconsin Wild and Scenic River Study.

USDA PROGRAMS

SOIL CONSERVATION SERVICE

Conservation Operation Program, Public Law 74-46

This program includes activities authorized under the Soil Conservation Act (Public Law 46, 74th Congress 1935). The SCS carries out a broad program of soil and water conservation, including direct assistance to landowners and operators and technical services to other agencies and organizations.

The primary function of the SCS is assisting landowners and operators, who are cooperating either individually or with their respective SWCD, to get conservation on the land.

Small Watershed Program, Public Law 83-566.

The Watershed Protection and Flood Prevention Act (1954), as amended, authorizes the Secretary of Agriculture to give technical and financial help to local organizations in planning and carrying out upstream watershed projects. Project purposes include watershed protection, flood prevention, agricultural water management, recreation, municipal and industrial water supply, and fish and wildlife developments. The Federal aspects of the program are administered by SCS.

The objective of this Act is to bridge the gap between an agricultural program of technical assistance to landowners and flood prevention programs or multiple-purpose developments in upstream watersheds. Within the Basin, 19 PL-566 project type watersheds have been studied. Ten watersheds have been approved for operations of which 2 are completed and 2 are inactive. Planning approval for remaining 9 watersheds has been suspended or terminated.

Flood Plain Management Assistance Program, Public Law 83-566

The objectives of this cooperative program are (1) to develop and furnish information on flood hazards and flood plains, (2) to provide interpretations of flood hazard data, and (3) to provide technical assistance needed by other Federal agencies and State and local governments in formulating, revising, and implementing their flood plain management programs.

The Resource Conservation and Development Program, Public Law 87-703

The Resource Conservation and Development (RC&D) program was authorized by the Food and Agriculture Act of 1962. It expands opportunities for conservation districts, local units of government, and individuals to improve their communities in multicounty areas. The program can assist them in enhancing their economic, environmental, and social well-being.

Portions of four authorized project areas are in the Basin. The four authorized areas are the Golden Sands, Lumberjack, Pri-Ru-Ta, and River Country.

AGRICULTURAL STABILIZATION AND CONSERVATION SERVICE

Agricultural Conservation Program, Public Law 74-46

The programs of ASCS provide cost sharing for carrying out soil, water, woodland, and wildlife conservation measures.

The Agricultural Conservation Program (ACP) initially authorized in 1936, is the major conservation cost-sharing program in use. Among the major objectives of ACP is the prevention and abatement of agricultural-related pollution of water. Pollution abatement and conservation practices, for which technical standards are prescribed, are performed under the ACP with technical

assistance and supervision from SCS. Forestry practices are performed under the ACP with technical assistance and supervision from the Wisconsin DNR, and the USDA Forest Service (FS).

The Drought and Flood Conservation Program, Public Law 95-240, and the Emergency Conservation Measures Program, Public Law 85-58, provide cost-sharing assistance for repairing damage to farmland and conservation measures caused by weather-related elements.

The Water Bank Act, Public Law 91-559, authorized the Secretary of Agriculture to formulate and carry out a continuous program to prevent the serious loss of wetlands and to improve and enhance these wetlands and surrounding areas for breeding and nesting cover for migratory waterfowl.

The Forestry Incentives Program, Public Law 91-524.

Forestry Incentives Program (FIP) provides cost-sharing assistance to owners of woodlands, for planting trees and/or improving stands of forest trees. The purpose of the program is to assure a future supply of timber products.

FARMERS HOME ADMINISTRATION

Grant and Loan Programs, Public Law 92-419, as amended; et al. Credit assistance is available from FmHA. This includes loans for farm ownership, farm operations, emergencies, rural housing, recreational enterprises, and grazing associations. Loans for water and waste disposal systems are available for communities with less than 10,000 population.

SCIENCE AND EDUCATION ADMINISTRATION

Cooperative Extension Service Information Programs Smith-Levy Act of 1914; Public Law 92-419

Cooperative Extension Service (CES) acts as the education agency of the USDA and the land grant universities. Extension specialists work with other agencies to provide information to local people relating to the soil and water conservation programs. Three levels of government--Federal, State, and county--share in financing, planning, and carrying out extension educational programs.

FOREST SERVICE

Cooperative Forestry Assistance Act of 1978; Public Law 95-313

The USDA Forest Service, along with the State foresters, has responsibility for national leadership in forestry. Northeastern Area State and Private Forestry with the Wisconsin State forester provides leadership in Wisconsin.

Many cooperative forestry programs are administered through the above authority. Technical assistance is available through cooperative forest management, fire control, insect and disease management, urban forestry assistance, planning assistance, and rural forestry assistance. Forest industries may receive assistance in forest products utilization, marketing, and management.

OTHER FEDERAL AGENCIES' OR COMMISSIONS' PROGRAMS

Department of the Army

CORPS OF ENGINEERS

The Corps of Engineers programs include water resource developments for flood control and navigation and Flood Plain Management Services (FPMS) authorized by the Flood Control Act of 1960, as amended; Public Law 86-645.

The objectives of FPMS is to promote appropriate recognition of flood hazards in land and water use planning and development through the provision of needed information, technical services, and guidance.

Department of Housing and Urban Development

FLOOD INSURANCE AND ADMINISTRATION

The Flood Insurance Administration (FIA) Flood Insurance programs, Public Law 90-448 and the Flood Disaster Protection Act of 1973, Public Law 93-234, enables persons to purchase insurance against losses covered by floods and to promote wise flood plain management practices.

Department of the Interior

HERITAGE CONSERVATION AND RECREATION SERVICE

The Heritage Conservation and Recreation Service (HCRS) Technical Assistance and Land Acquisition Programs are authorized by the Land and Water Conservation Act of 1965; Public Law 88-578, as amended; Public Law 88-29; Public Law 90-452; et al.

U.S. FISH AND WILDLIFE SERVICE (FWS)

The U.S. Fish and Wildlife Service (FWS) has broad responsibilities for the preservation, study, and propagation of wildlife resources, fishery resources, habitat preservation, endangered and threatened species, grants-in-aid programs, and interfacing with the public through various interpretation and recreational programs.

Authority for the fish and wildlife restoration, technical assistance and grant programs are the Fish and Wildlife Coordination Act, Public Law 85-624, as amended; Fish and Wildlife Act of 1956; Sport Fish Restoration Act of 1950; Wildlife Restoration Act of 1937; and the Endangered Species Act of 1973, Public Law 93-205.

U.S. GEOLOGICAL SURVEY

The Federal-State Cooperative Programs of the Geological Survey authorized by the Act of March 3, 1879 include geologic and minerals resources surveys and mapping, topographic surveys and mapping, and water resources investigations. Water resource investigations provide water information for economic development and best use of water resources.

U.S. Environmental Protection Agency

The areas of major concern to the U.S. Environmental Protection Agency (EPA) include air, water and noise pollution, and hazardous materials control. The nonpoint source water pollution control aspects of Public Law 92-500 are important to this Basin.

Upper Mississippi River Basin Commission

The Upper Mississippi River Basin Commission, established by Executive Order 11656, March 1972, is one of seven such commissions established under the Water Resources Planning Act of 1965 to provide coordinated and comprehensive planning for the development of the water and land resources. Membership of the Commission consists of five states and ten Federal agencies. The Wisconsin River Basin is a part of the study area.

STATE OF WISCONSIN PROGRAMS

The responsibilities of State government in the conservation and enhancement of resources are shared by the legislative, executive, and judicial branches of the State of Wisconsin. The legislative branch broadly determines new or changed policies and programs. The judicial branch adjudicates in disputes over interpretation or application of laws. The executive branch carries out policies and programs and is most intimately involved in a planning process.

Soil and Water Conservation Districts

The State of Wisconsin, under Chap. 92, Stats., has authorized the establishment of soil and water conservation districts (SWCD's) as special purpose units of government, organized and operating at the county level. The State Board of Soil and Water Conservation Districts (BSWCD), created under Chap. 15 Stats., guides and coordinates the programs of the SWCD's.

Soil and Water Conservation Districts' Programs

The governing body of each SWCD is composed of the same individuals who serve on the county Agriculture and Extension Education Committee of the county board of supervisors. They are responsible for planning and carrying out a program to assist cooperating land users and local units of government in the conservation and proper management of soil, water, and related natural resources.

The districts request technical assistance from SCS through the provisions of the Soil Conservation Act. This technical assistance is then made available to the landowners, who are cooperators with an SWCD, to plan and use their land within its capabilities. This technical assistance consists of soil surveys and interpretations, finding and improving plant materials for conservation uses, and providing agronomic and engineering field assistance in applying conservation measures. The BSWCD and local county SWCD cooperate in the implementation of Wisconsin's Nonpoint Source Water Pollution Abatement Program, Chap. 144 Stats. DNR also provides technical assistance to private land users through SWCD's in the areas of forestry and woodlot management and fish and wildlife habitat.

Department of Natural Resources

The Wisconsin DNR is vested with broad management authority over water and land resources of the State. Its programs include management of State forests, parks and recreation areas, land acquisitions, and fish and wildlife programs. The Department is also responsible for setting and enforcing regulations pertaining to the discharge of waste to the air, lands, and waters of the State.

Technical assistance and cooperative programs are authorized by Chaps. 23; 29; 28; 1; 15; 16; 20; 26; 30; 31; 59; 60; 66; 70; 87; 88; 107; 144; and 147 Stats.

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NATURAL RESOURCE BASE

APPENDIX A

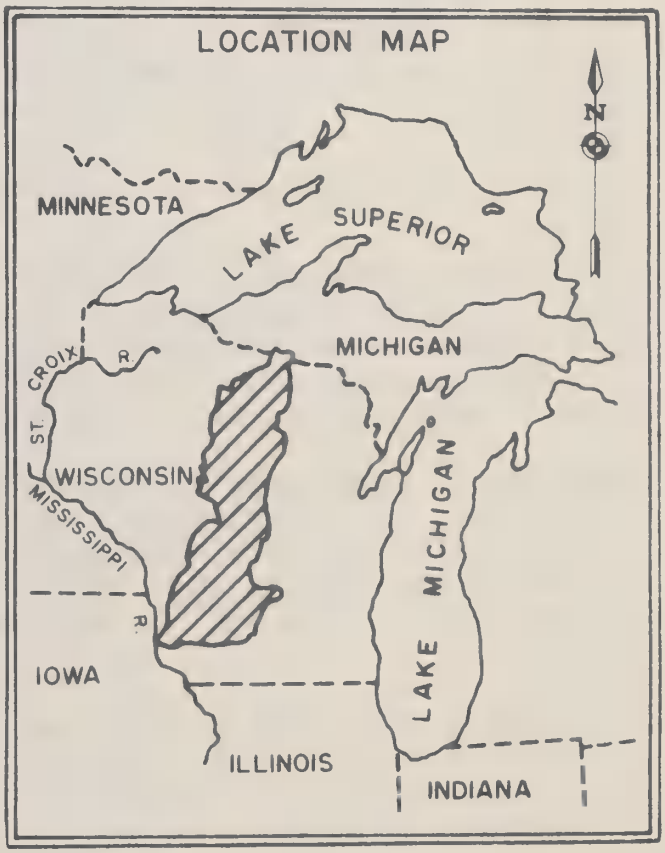
APPENDIX A - NATURAL RESOURCE BASE

The Wisconsin River Basin lies in the heartland of Wisconsin. Climate, physiography, soils, vegetation, geology, and water are environmental factors to be considered in planning resource development programs. Each is important and makes a unique contribution to the physical capacity, potential economic development, and environmental quality of the Basin. This appendix describes and inventories the natural resource base.

LOCATION

The Wisconsin River Basin lies in central Wisconsin with a drainage area of 7,680,000 acres (3,108,000 ha) or 12,000 square miles (31,080 sq km). Roughly rectangular in shape, it is about 220 miles (350 km) long from north to south and has an average width of 55 miles (90 km). To the north and east, the Basin is bounded by the Great Lakes-St. Lawrence River Basin. To the south and west are smaller tributaries to the Upper Mississippi River Basin. A general location map and a map showing the three economic plan areas and hydrologic boundary of the Basin are shown on this page and following page 2.

The Wisconsin River originates near the Wisconsin-Michigan border at Lac Vieux Desert, flows 430 miles (690 km) through the center of Wisconsin and empties into the Mississippi River south of Prairie du Chien, Wisconsin. The direction of flow is generally south until it reaches Portage where it abruptly turns to the west. The river falls about 1,050 feet (320 meters-m) from its source to the Mississippi River.



Major tributaries of the Wisconsin River and their respective drainage areas are the Tomahawk River, 567 square miles (1,468 sq km); the Big Eau Pleine River, 367 square miles (950 sq km); the Yellow River, 706 square miles (1,828 sq km); the Baraboo River, 650 square miles (1,684 sq km); and the Kickapoo River, 760 square miles (1,968 sq km).

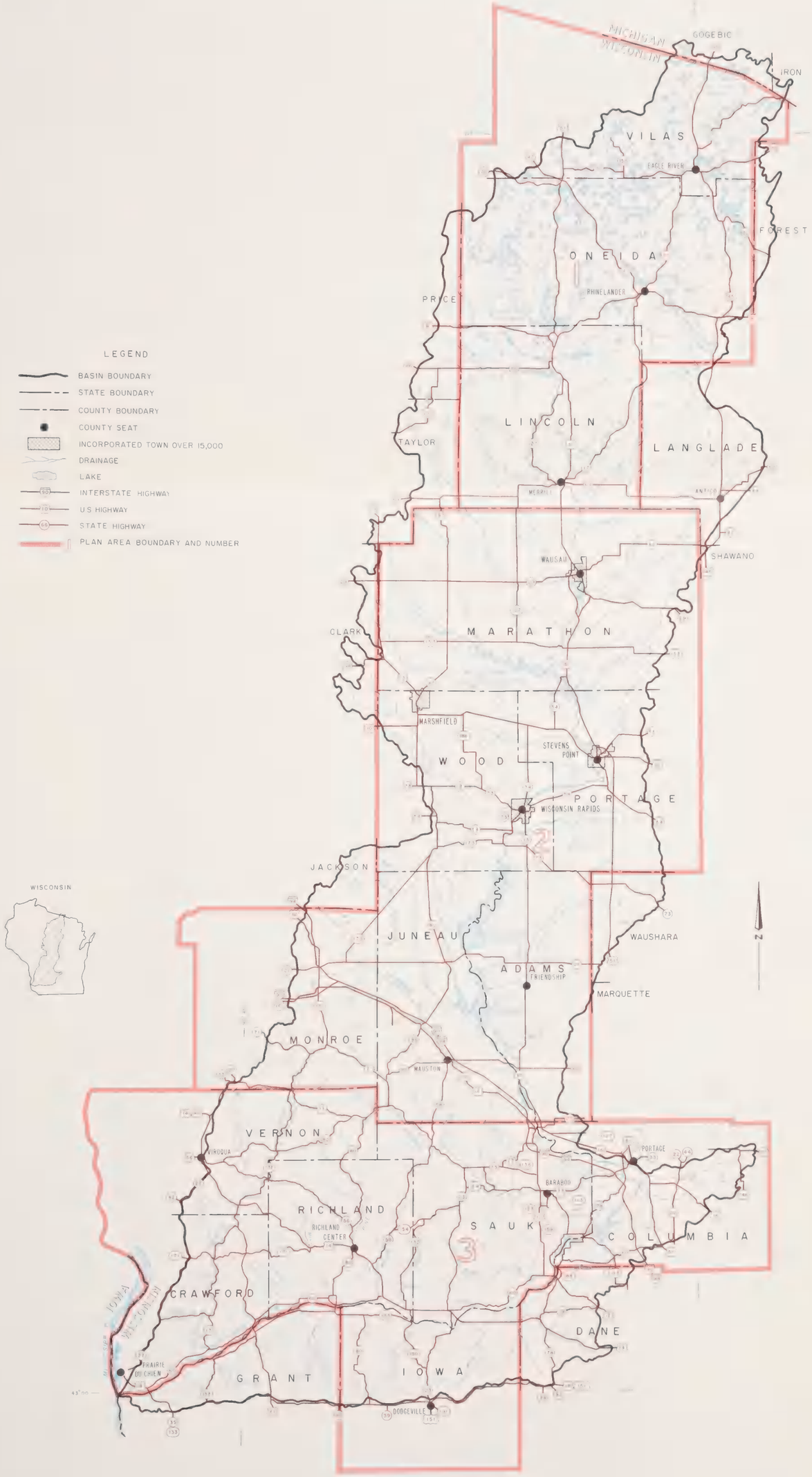
Wisconsin River - Looking Downstream From U.S. Highway 14 Bridge Near Spring Green, Sauk County. Here the river is shallow with a sand bedload.

CLIMATE

The humid, continental climate of the Wisconsin River Basin is influenced by storms which move eastward along the northern border of the United States and those which move northeastward from the southwest to the Great Lakes. The winters, especially in the northern part of the Basin, may be long and severe, while the summers in the south are very warm and humid.

Mean annual temperature is about 44° Fahrenheit (F). The mean temperatures in January, the coldest month, vary from about 13° F. in the north, to 24° F. in the south. The mean temperatures in July, the warmest month, vary from 66° F. in the north to about 73° F. in the south. For short durations, temperatures may exceed 100° F. in the summer and drop below -30° F. in the winter.

The last killing frost in spring varies from mid-April to late May and the first killing frost in fall occurs from mid-September to mid-October. Frost-free days vary from 90 days in the north, to 160 days in the south. A map of the average length of growing season precedes page 3.



WISCONSIN RIVER BASIN

WISCONSIN AND MICHIGAN

SOURCE
USGS 1/250,000 AND 15 MINUTE TOPOGRAPHIC QUADRANGLES AND INFORMATION FROM FIELD TECHNICIANS
TRANSVERSE MERCATOR PROJECTION

USDA-SCS-LINCOLN, NEBR. 1979

Rev. 2-7-79
5,R-32,569.6

The average annual precipitation ranges from 29 to 33 inches (74-84 centimeters - cm). Approximately 55 percent of the precipitation occurs during May through September. Rainfall is evenly distributed; moisture is usually sufficient for crops. An annual precipitation map follows page 4.

The greatest amount of snowfall occurs in the north, where some areas average 65 inches (165 cm). In the south, the average snowfall is about 35 inches (89 cm).

During the summer months, thunderstorms occur frequently, are occasionally violent, and are often accompanied by damaging hail and high winds. The number of thunderstorms per year varies from about 30 in the north to over 40 in the south. Tornados occur occasionally. The estimated 100-year frequency 24-hour rainfall amounts range from five inches (13 cm) in the northern counties to over six inches (15 cm) near the Wisconsin-Illinois border.

Evapotranspiration varies from about 19 inches (48 cm) in the northern part of the Basin to 20 inches (51 cm) in the southern portion. Data by the month for typical mean percent of precipitation, runoff, and evaporation are shown on page 4.

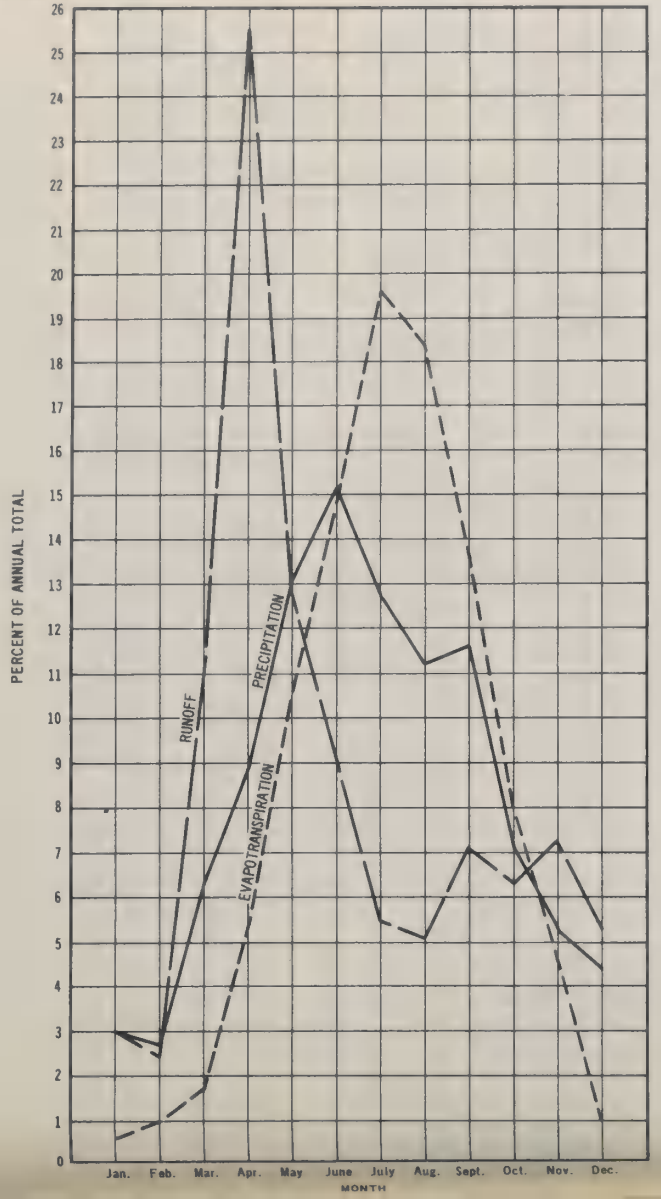
PHYSIOGRAPHY AND GEOLOGY

The boundary between the Wisconsin River Basin and the Great Lakes-St. Lawrence Basin is, for the most part, surficially expressed by marginal and terminal moraine deposits of Pleistocene ice sheets. The western margin is less well defined and consists of a series of watershed divides with major rivers such as the Chippewa and Black. The southern boundary along the Military Ridge in Iowa and Grant Counties is a well-defined, westerly trending divide. This separates the steep and short north-flowing tributaries to the Wisconsin River from the Galena, Grant Platte, and Pecatonica Rivers which drain south as tributaries to the Mississippi River. The rather abrupt westward turn of the Wisconsin River near Portage may be due to stream piracy. Relief ranges from 604 feet (184 m) above mean sea level at the confluence of the Wisconsin and Mississippi Rivers to 1,940 feet (591 m) mean sea level at Rib mountain, Marathon County.

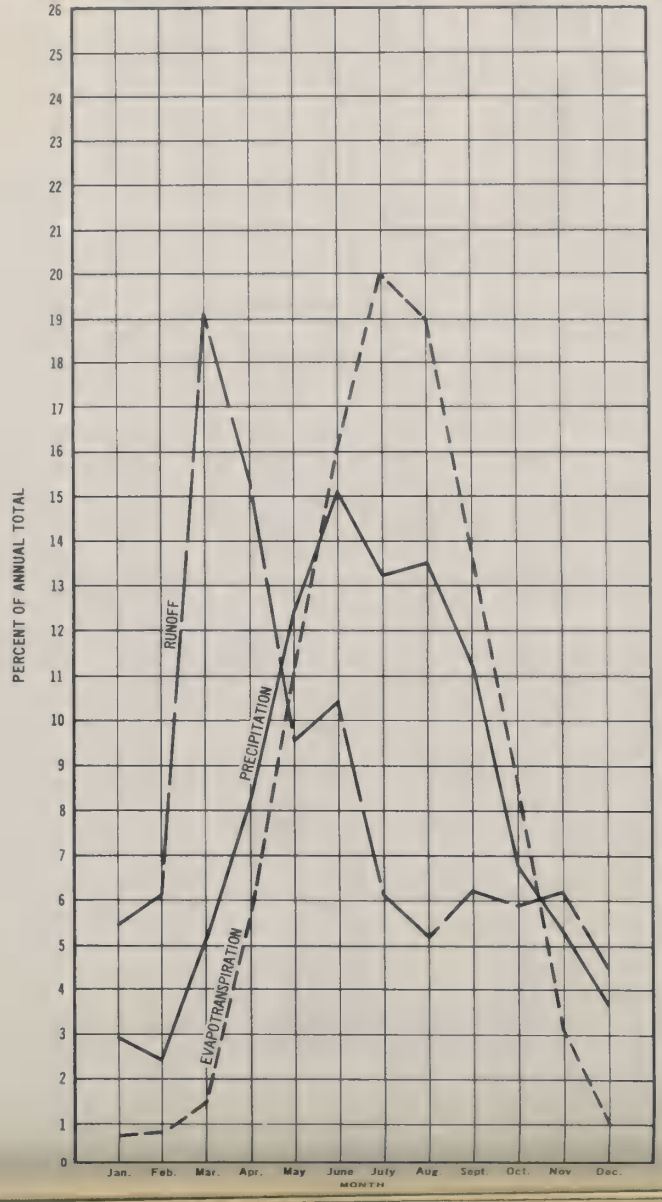
The Basin includes a portion of four of five land forms or geomorphic regions of the State. These are the Northern Highland, 45 percent of the Basin area; the Central Plain, 22 percent; the Eastern Ridges and Lowlands, 3 percent; and the Western Upland, 30 percent. Geomorphic regions are shown on the map following page 6. The bedrock geologic map precedes page 7. The stratigraphic column follows page 8.

TYPICAL MEAN MONTHLY PERCENT OF ANNUAL TOTAL PRECIPITATION RUNOFF, AND EVAPOTRANSPIRATION WISCONSIN RIVER BASIN

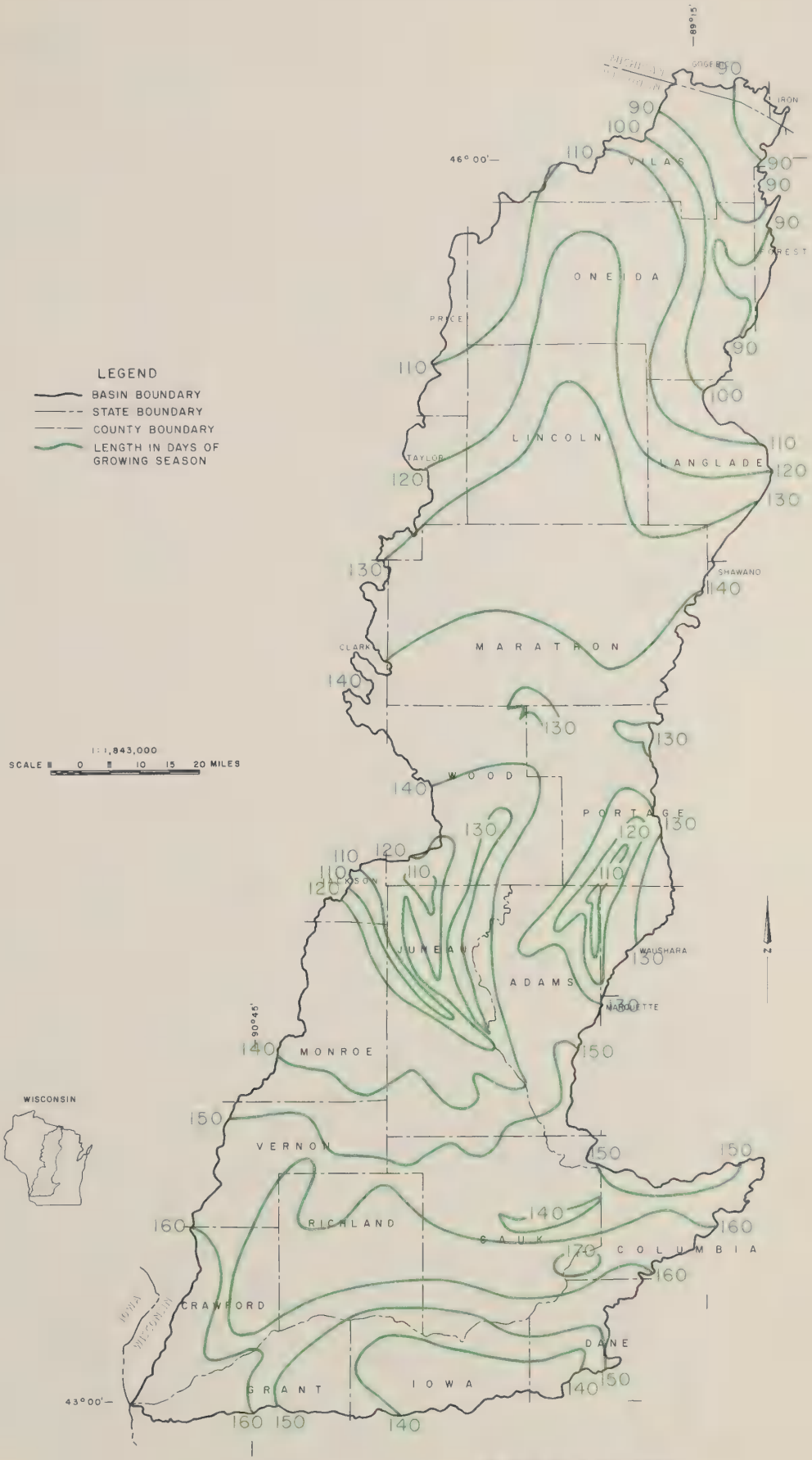
UPPER WISCONSIN BASIN
TYPICAL MEAN MONTHLY PERCENT OF PRECIPITATION, RUNOFF AND EVAPOTRANSPIRATION ANNUAL TOTAL



LOWER WISCONSIN BASIN
TYPICAL MEAN MONTHLY PERCENT OF PRECIPITATION, RUNOFF AND EVAPOTRANSPIRATION ANNUAL TOTAL



U. S. DEPARTMENT OF AGRICULTURE



WISCONSIN RIVER BASIN
WISCONSIN, MICHIGAN

AVERAGE LENGTH OF GROWING SEASON MAP

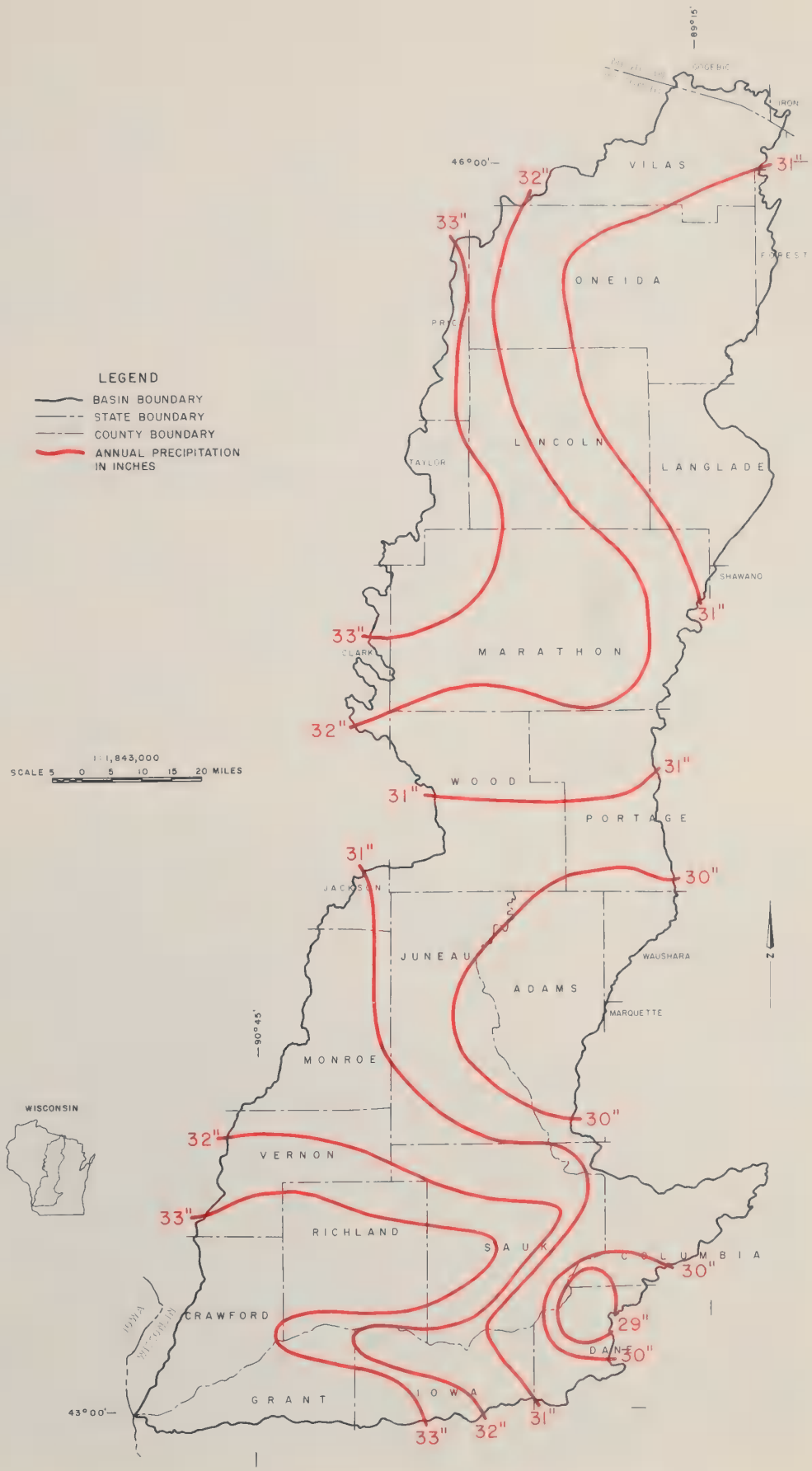
U.S. DEPARTMENT OF AGRICULTURE

Economics, Statistics, and Cooperatives Service,
Forest Service, and Soil Conservation Service

SOURCE OF DATA:
AGRICULTURAL EXPERIMENTAL STATION,
UNIVERSITY OF WISCONSIN.
SOURCE:
DRAWING NUMBER 5,R-32,569 AND
INFORMATION FROM FIELD TECHNICIANS.
TRANSVERSE MERCATOR PROJECTION.
USDA-SCS-LINCOLN, NEBR. 1978

Rev. 8-1-78
5,0-36,343

U. S. DEPARTMENT OF AGRICULTURE



WISCONSIN RIVER BASIN
WISCONSIN, MICHIGAN
ANNUAL PRECIPITATION MAP

U.S. DEPARTMENT OF AGRICULTURE

Economics, Statistics, and Cooperatives Service,
Forest Service, and Soil Conservation Service

SOURCE OF DATA
WISCONSIN WEATHER, 8-67, U.S. DEPARTMENT OF AGRICULTURE, STATISTICAL REPORTING SERVICE.
SOURCE:
DRAWING NUMBER 5,R-32,569 AND INFORMATION FROM FIELD TECHNICIANS.
TRANSVERSE MERCATOR PROJECTION.

USDA-SCS-LINCOLN, NEBR. 1978

Rev. 8-1-78
5,0-36,344

The Northern Highland extends from Lac Vieux Desert on the Michigan-Wisconsin border south to central Wood County. Heavily forested terrain with many lakes, potholes, and wetlands of the north is gradually replaced by a rolling topography of farmland-woodland mixture in the vicinity of Merrill in Lincoln County. Pleistocene till, outwash, and moraine fields mantle an ancient and worn-down Precambrian surface of igneous and metamorphic rocks that show complex folding and faulting. Occasionally, Precambrian "monadnocks" such as the Rib Mountain quartzite have a relief of several hundred feet. Scattered Upper Cambrian marine sandstone remnants are found in the southern part of the region.

The Central Plain, located mostly in Wood, Portage, Juneau, and Adams Counties, has two conspicuous "monadnocks" of Precambrian quartzite: Hamilton Mound in Adams County and Necedah Mound in Juneau County. The Upper Cambrian sandstones are exposed in road cuts, streambanks, and as conspicuous castellated mounds or bluffs with several hundred feet of relief above Pleistocene outwash and glacial lake deposits. The sandstones dip slightly to the south and vary in thickness from about 100 feet (30 m) in the north to about 400 feet (120 m) in the south. The Upper Cambrian sandstones are generally overlain by alluvium, colluvium, and soils of Recent age or Pleistocene glacial deposits. Thickness of Recent and Pleistocene materials is quite variable, ranging from 0 to over 300 feet (90 m). The most conspicuous topographic feature is the Johnstown terminal moraine which is approximately the eastern boundary in this region.

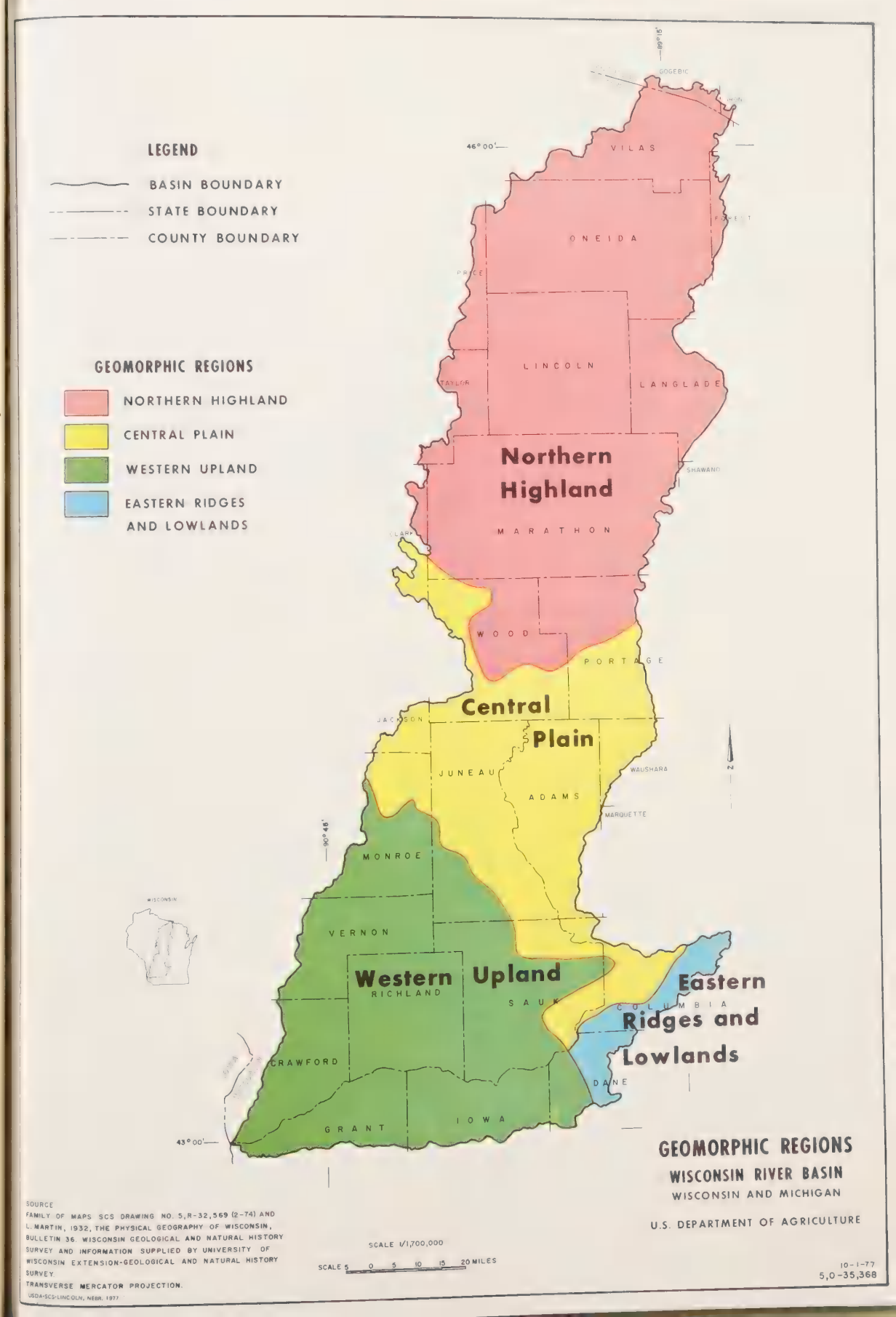
Castellated Upper Cambrian Sandstone Rising Above the Central Plain Near Petenwell Dam, Juneau County

A small area of the Eastern Ridge and Lowlands is found in Columbia and Dane Counties. This area has been glaciated with thick to thin glacial outwash, ground moraine, deltaic, and miscellaneous drift deposits. There are occasionally Paleozoic marine shale, sandstone, limestone, or dolomite outcrops along drainage lines with dip to the east.

The regional land form of the Western Upland is a dissected plateau in late youth or early maturity. The most conspicuous topographic feature of the area is the great valley of the Wisconsin River and the exhumed Baraboo quartzite range of Precambrian age. The flood plain of the Wisconsin River is more than four miles wide at Prairie du Sac, Sauk County; about two miles wide at Muscoda, Grant County; and narrows to one-half mile at Bridgeport, Crawford County which is some ten miles from the Mississippi River. Above the flood plain are a series of terraces eroded from valley train outwash which Pleistocene ice front streams discharged into the Wisconsin River Valley.

There are numerous Paleozoic marine sediment outcrops in the Western Upland. The Blue Mounds are two Silurian outliers of reddish-brown silicified dolomite. Some ridgetops in Crawford, Sauk, Monroe and Richland Counties have small discontinuous Cretaceous outcrops of resistant quartz and chert gravels. A Cambrian sandstone, the Galesville, forms low cliffs adjacent to the Wisconsin River and some tributary streams. Overlying Ordovician calcitic-dolomite is the dominant caprock of dissected ridgeland.

An 1876 View of the Confluence of the Wisconsin River With the Mississippi River - Owen's Report


LEGEND
BASIN BOUNDARY
STATE BOUNDARY
COUNTY BOUNDARY
GEOMORPHIC REGIONS
NORTHERN HIGHLAND
CENTRAL PLAIN
WESTERN UPLAND
EASTERN RIDGES AND LOWLANDS
89°15'
46°00'
43°00'
90°45'
GOGEBIC
VILAS
ONEIDA
PRICE
LINCOLN
TAYLOR
LANGLADE
FOREST
SHAWANO
Northern Highland
MARATHON
CLARK
WOOD
PORTAGE
JACKSON
Central Plain
JUNEAU
ADAMS
WAUSHARA
MARQUETTE
MONROE
VERNON
WISCONSIN
Western Upland
RICHLAND
SAUK
COLUMBIA
Eastern Ridges and Lowlands
CRAWFORD
DANE
GRANT
IOWA
N
SCALE 1/1,700,000
SCALE 5 0 5 10 15 20 MILES
SOURCE
FAMILY OF MAPS SCS DRAWING NO. 5,R-32,569 (2-74) AND L. MARTIN, 1932, THE PHYSICAL GEOGRAPHY OF WISCONSIN, BULLETIN 36. WISCONSIN GEOLOGICAL AND NATURAL HISTORY SURVEY AND INFORMATION SUPPLIED BY UNIVERSITY OF WISCONSIN EXTENSION-GEOLOGICAL AND NATURAL HISTORY SURVEY.
TRANSVERSE MERCATOR PROJECTION.
USDA-SCS-LINCOLN, NEBR. 1977
GEOMORPHIC REGIONS
WISCONSIN RIVER BASIN
WISCONSIN AND MICHIGAN
U.S. DEPARTMENT OF AGRICULTURE
10-1-77
5,0-35,368

BEDROCK GEOLOGIC MAP

WISCONSIN RIVER BASIN

WISCONSIN AND MICHIGAN

U.S. DEPARTMENT OF AGRICULTURE

SOURCE:
FAMILY OF MAPS SCS DRAWING NO. 5,R-32,569 (2-74), UNIVERSITY OF WISCONSIN-EXTENSION, GEOLOGICAL AND NATURAL HISTORY SURVEY, AND US GEOLOGICAL SURVEY.
TRANSVERSE MERCATOR PROJECTION

USDA-SCS-LINCOLN, NEBR. 1978

1/1,000,000

SCALE 5 0 5 10 15 20 MILES

11-11-77

5,0-36,572

Because the Paleozoic marine sediments have a general southerly dip or inclination, northern tributaries to the Wisconsin River such as the Pine and the Kickapoo have a rather gentle gradient or longer main stem and a larger watershed area. In contrast, Otter Creek and other southern tributaries have a steep gradient and shorter main stem. Almost all tributary streams have a dendritic drainage pattern. The ridgeland is relatively narrow. The valleys are deep with lower steep, stony wooded slopes frequently succeeded by vertical scarp or cliffs. The modern valley bottoms are narrow to wide, depending on the type of rock through which the stream has cut and the amount of coarse alluvium or slack water deposits and the number and width of old stream terraces. Floodplains are 200 to 600 feet (61 to 183 m) lower than the ridgeland.

Formations dip at less than one degree per mile to the southwest, which is similar to the general regional dip. There are minor folds, monoclines, and localized faults. The dip of current-bedded sandstones such as the Ordovician St. Peter Formation may be mistaken for true dip. Bedrock is mostly covered by soils colluvium, alluvium, and Pleistocene loess and outwash in the main valley.

Based on geologic considerations, recorded earthquake phenomena and the location of earthquake damaged areas, the Wisconsin River Basin is in Zone 1 of the Seismic Risk Map of the United States. 1/ Zone 1, of a 0 to 3 classification, is an area of expected minor damage from earthquakes.

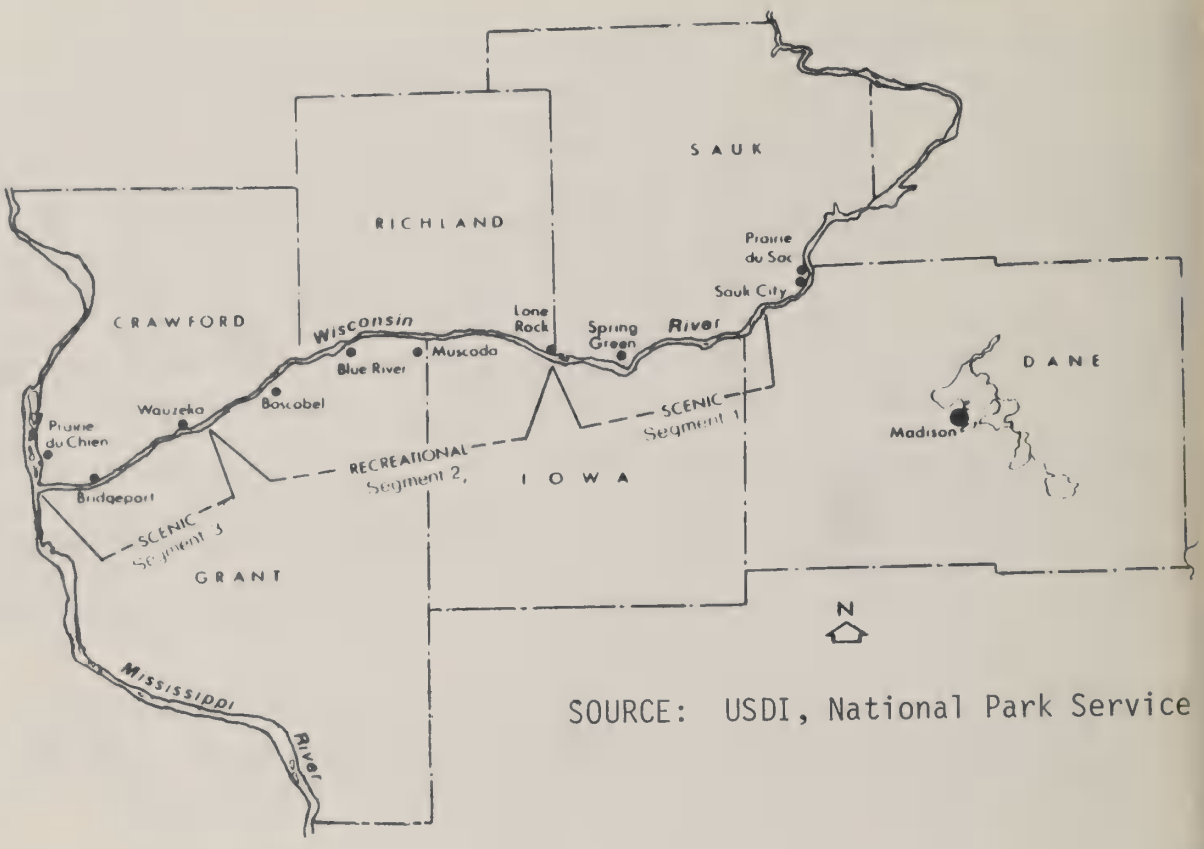
Natural Scenic Features

Natural scenic features are numerous because of wide variations in topography, vegetative cover, and land use. The many mounds, cliffs, and isolated rock-knobs offer panoramic vistas of much of the agricultural and forested landscape. Rib Mountain of Marathon County, the Baraboo Range of Sauk and Columbia Counties, and Blue Mounds of Dane and Iowa Counties are a few of the impressive scenic overlooks.

The lower Wisconsin River, from the Prairie du Sac Dam to its confluence with the Mississippi River, is being evaluated for inclusion in the National Wild and Scenic River System under Public Law 90-452 of 1968. This Act was amended in 1975 to include a suitability study of the lower 90 miles (145 km) of the Wisconsin River. See page 8 for location map.

The U. S. Department of Agriculture, Forest Service; and the U. S. Department of the Interior, National Park Service have joint responsibility for the study. The study was initiated in April 1975. Study associates representing various State and Federal agencies and private groups provided valuable input in collecting and interpreting data.

1/ Seismic Risk Map, 1969, Environmental Science Services Administration, Coast and Geodetic Survey.



SOURCE: USDI, National Park Service

Location of Suitability Study of Lower Wisconsin For Possible Inclusion in the National Wild and Scenic River System

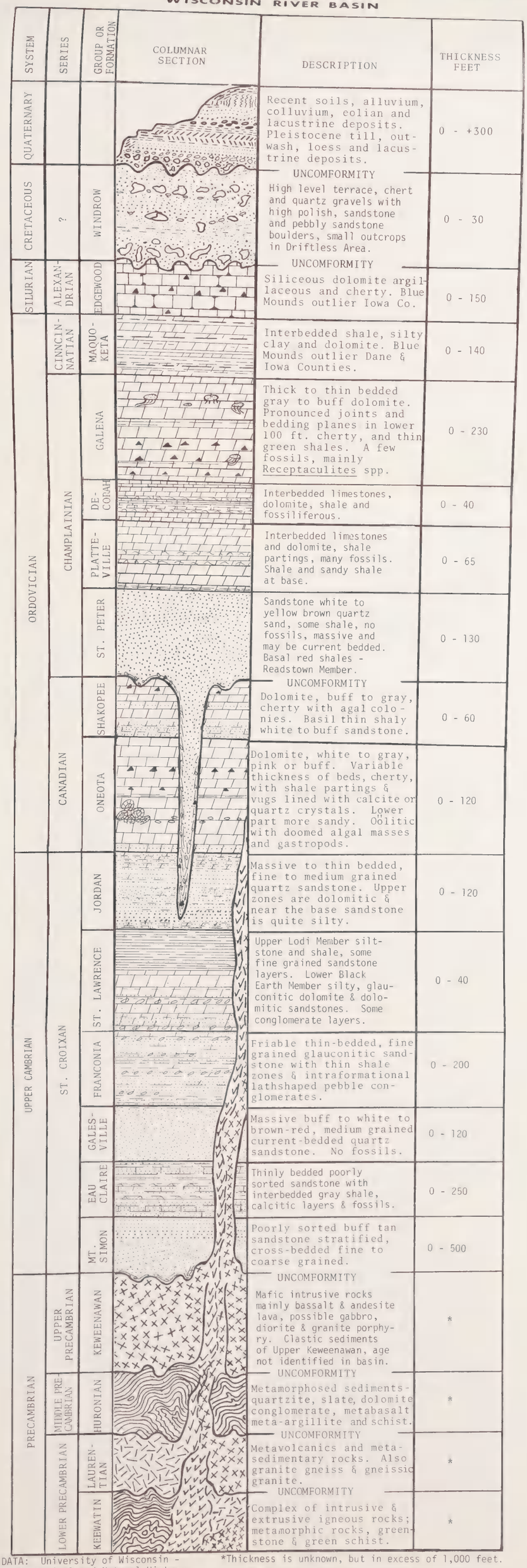
Scientific Areas

The Scientific Areas Preservation Council, Wisconsin Department of Natural Resources, "recommends policy and management techniques to State and Federal agencies on preservation of areas for scientific research and natural studies based on ecological surveys". 1/ These areas, because of limited extent, rarity, or floral and faunal associations or geologic uniqueness, provide natural areas for study and enjoyment by the scientist and layman. Such areas preserve and maintain a high environmental quality. In 1977, there were 39 scientific areas in the Wisconsin River Basin - 13 in Plan Area 1, 4 in Plan Area 2, and 20 in Plan Area 3. Table A-1, page 9, lists them by plan area and name.

The only published county inventories are for Richland, Sauk, and Iowa Counties in Plan Area 3.

1/ 1977 Wisconsin Blue Book, p. 74.

STRATIGRAPHIC COLUMN
WISCONSIN RIVER BASIN



SYSTEM	SERIES	GROUP OR FORMATION	DESCRIPTION	THICKNESS FEET
QUATERNARY			Recent soils, alluvium, colluvium, eolian and lacustrine deposits. Pleistocene till, outwash, loess and lacustrine deposits.	0 - +300
			UNCOMFORMITY	
CRETACEOUS	?	WINDROW	High level terrace, chert and quartz gravels with high polish, sandstone and pebbly sandstone boulders, small outcrops in Driftless Area.	0 - 30
			UNCOMFORMITY	
SILURIAN	ALEXANDRIAN	EDGEWOOD	Siliceous dolomite argillaceous and cherty. Blue Mounds outlier Iowa Co.	0 - 150
ORDOVICIAN	CINCINNATIAN	MAQUOKETA	Interbedded shale, silty clay and dolomite. Blue Mounds outlier Dane & Iowa Counties.	0 - 140
	CHAMPLAINIAN	GALENA	Thick to thin bedded gray to buff dolomite. Pronounced joints and bedding planes in lower 100 ft. cherty, and thin green shales. A few fossils, mainly Receptaculites spp.	0 - 230
		DECORAH	Interbedded limestones, dolomite, shale and fossiliferous.	0 - 40
		PLATTEVILLE	Interbedded limestones and dolomite, shale partings, many fossils. Shale and sandy shale at base.	0 - 65
		ST. PETER	Sandstone white to yellow brown quartz sand, some shale, no fossils, massive and may be current bedded. Basal red shales - Readstown Member.	0 - 130
			UNCOMFORMITY	
	CANADIAN	SHAKOPEE	Dolomite, buff to gray, cherty with agal colonies. Basil thin shaly white to buff sandstone.	0 - 60
		ONEOTA	Dolomite, white to gray, pink or buff. Variable thickness of beds, cherty, with shale partings & vugs lined with calcite or quartz crystals. Lower part more sandy. Oolitic with doomed algal masses and gastropods.	0 - 120
UPPER CAMBRIAN	ST. CROIXAN	JORDAN	Massive to thin bedded, fine to medium grained quartz sandstone. Upper zones are dolomitic & near the base sandstone is quite silty.	0 - 120
		ST. LAWRENCE	Upper Lodi Member siltstone and shale, some fine grained sandstone layers. Lower Black Earth Member silty, glauconitic dolomite & dolomitic sandstones. Some conglomerate layers.	0 - 40
		FRANCONIA	Friable thin-bedded, fine grained glauconitic sandstone with thin shale zones & intraformational lathshaped pebble conglomerates.	0 - 200
		GALESVILLE	Massive buff to white to brown-red, medium grained current-bedded quartz sandstone. No fossils.	0 - 120
		EAU CLAIRE	Thinly bedded poorly sorted sandstone with interbedded gray shale, calcitic layers & fossils.	0 - 250
		MT. SIMON	Poorly sorted buff tan sandstone stratified, cross-bedded fine to coarse grained.	0 - 500
			UNCOMFORMITY	
PRECAMBRIAN	UPPER PRECAMBRIAN	KEWEENAWAN	Mafic intrusive rocks mainly bassalt & andesite lava, possible gabbro, diorite & granite porphyry. Clastic sediments of Upper Keweenawan, age not identified in basin.	*
			UNCOMFORMITY	
	MIDDLE PRECAMBRIAN	HURONIAN	Metamorphosed sediments-quartzite, slate, dolomite conglomerate, metabasalt meta-argillite and schist.	*
			UNCOMFORMITY	
	LOWER PRECAMBRIAN	LAURENTIAN	Metavolcanics and metasedimentary rocks. Also granite gneiss & gneissic granite.	*
			UNCOMFORMITY	
		KEEWATIN	Complex of intrusive & extrusive igneous rocks; metamorphic rocks, greenstone & green schist.	*

SOURCE OF DATA: University of Wisconsin - Extension, Geological and Natural History Survey, U. S. Geological Survey and others.

*Thickness is unknown, but in excess of 1,000 feet.

NOTE: Only major uncomformities are shown.

DA-SCS-LINCOLN, NEBR. 1978

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5,P-36,642

STRATIGRAPHIC CORRELATION
WISCONSIN RIVER BASIN

Table A-1 Scientific Areas
Wisconsin River Basin

COUNTY	NAME OF SCIENTIFIC AREA	REMARKS
Plan Area 1		
VILAS	High Lake Spruce - Balsam Forest	
	Trout Lake Conifer Swamp	
	Plum Lake - Star Lake Hemlock Forest	
	Black Tern Bog	Floating Bog
	Bittersweet Lakes	Four Lakes
	Aurora Lake	Wild Rice & Other Aquatic Plants
	Johnson Lake Barrens	Pine Barrens. Sandy Outwash Plain
	Escanaba Lake Hemlocks	Surrounded by Conifer Swamp
ONEIDA	Finnerud Pine Forest	Also Sphagnum Bog
	Rice Lake - Thunder Lake Marsh	Wild Rice & Sedge Meadow
	Holmboe Conifer Forest	
	Gobler Lake	
LINCOLN	Council Grounds Pine Forest	
Plan Area 2		
MARATHON	Dells of the Eau Claire River	E.C.R. Cascades Over Hard, Metamorphic Rock
PORTAGE	Buena Vista Prairie & Meadow	
JUNEAU	Necedah Oak - Pine Forest & Natural Area	Part of Necedah National Wildlife Refuge
	Blackhawk Island	Undisturbed Wooded Island
Plan Area 3		
VERNON	Mt. Pisgah Hemlock - Hardwoods	Relict Stand
RICHLAND	Hub City Bog	Tamarack Bog
SAUK	Ableman's Gorge	Exposure of the Baraboo Syncline
	Baxter's Hollow	Dry - Mesic Forest
	Devil's Lake Red Oak Forest	
	Parfrey's Glen	Ravine Cut Rare Plants
	Pine Glen	Deep Gorge in the Baraboo Range
	Pine Hollow	
	Durst Rock Shelter	Archeologically Important
	Natural Bridge & Rock Shelter	Archeologically Important
	Bear Creek Cave	
	Honey Creek Natural Area	Bird Sanctuary
	Spring Green Prairie	
COLUMBIA	Gibralter Rock	Sandstone Bluff
	Goose Pond	Migrating & Shore Birds
IOWA	Avoca River Bottom Prairie	Tall Grass Prairie on Outwash Sand Terrace of Wisconsin River
	Tower Hill Bottoms	Flood Plain Forest Along Wisconsin River
	Pine Cliff	

A Scenic Overlook From Gibraltar Rock
Columbia County, Plan Area 3

Commercial Mineral Resources

All counties in the Basin have one or more mineral resource development. Nonmetallic mineral commodities comprise nearly 90 percent of the total mineral output value. Principal commercial minerals are sand, gravel, limestone, and sandstone. Sand and gravel are the most important mineral commodity in terms of output value. Marathon County has clay, quartzite, and granite in addition to the other mineral resources. Quartzite is quarried in Sauk County. In the early 1900's, an iron-bearing formation in the Baraboo Range of Sauk County was mined. Until recently, thick accumulations of glacial debris have discouraged mineral exploration in the north. It is possible that iron, copper, and other metallic deposits are beneath glacial deposits in several of the northern counties.

The Minerals Yearbook published by the United States Bureau of Mines gave a value in 1974 of nearly $14,000,000 for Basin mineral production: $1,300,000 from Plan Area 1; $7,142,000 from Plan Area 2; and $5,420,000 from Plan Area 3. No value was given for two counties in Plan Area 2 and three counties in Plan Area 3, table A-2.

Preliminary estimates for mineral production in 1975 indicate a record dollar value in the State. Mineral resource distribution by counties is shown on the map following page 10.

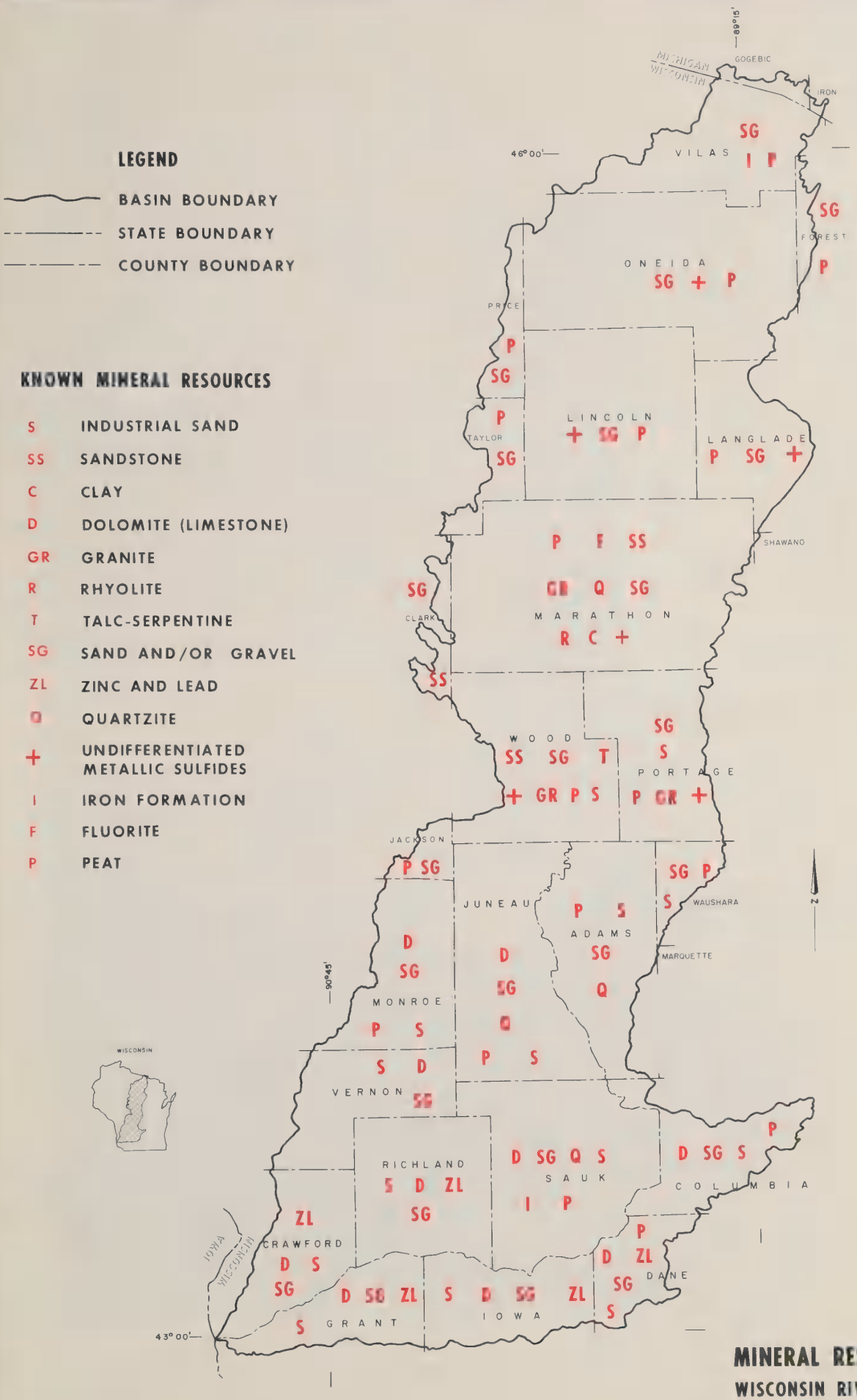

LEGEND
BASIN BOUNDARY
STATE BOUNDARY
COUNTY BOUNDARY
KNOWN MINERAL RESOURCES
S INDUSTRIAL SAND
SS SANDSTONE
C CLAY
D DOLOMITE (LIMESTONE)
GR GRANITE
R RHYOLITE
T TALC-SERPENTINE
SG SAND AND/OR GRAVEL
ZL ZINC AND LEAD
Q QUARTZITE
+ UNDIFFERENTIATED METALLIC SULFIDES
I IRON FORMATION
F FLUORITE
P PEAT
MICHIGAN
WISCONSIN
GOGEBIC
IRON
VILAS
ONEIDA
FOREST
PRICE
LINCOLN
TAYLOR
LANGLADE
SHAWANO
CLARK
MARATHON
WOOD
PORTAGE
WAUSHARA
JACKSON
JUNEAU
ADAMS
MARQUETTE
MONROE
VERNON
RICHLAND
SAUK
COLUMBIA
CRAWFORD
DANE
GRANT
IOWA
WISCONSIN
IOWA
90°45'
46°00'
43°00'
N
SOURCE:
FAMILY OF MAPS SCS DRAWING NO. 5,R-32,569(2-74) AND MICHIGAN DEPARTMENT OF NATURAL RESOURCES GEOLOGICAL SURVEY, UNIVERSITY OF WISCONSIN EXTENSION-GEOLOGICAL AND NATURAL HISTORY SURVEY, AND U.S. GEOLOGICAL SURVEY.
TRANSVERSE MERCATOR PROJECTION.
1/1,700,000
SCALE 5 0 5 10 15 20 MILES
MINERAL RESOURCES
WISCONSIN RIVER BASIN
WISCONSIN AND MICHIGAN
U.S. DEPARTMENT OF AGRICULTURE
REV. 6-78
5,0-35,367
USDA-SCS-LINCOLN, NEBR. 1978

Table A-2

Mineral Production Value, 1974
Wisconsin River Basin

PLAN AREA	COUNTY	VALUE	
1	Vilas	$ 242,000	
	Oneida	517,000	
	Lincoln	541,000	
		$ 1,300,000	
2	Marathon	5,666,000	
	Wood	148,000	
	Portage	927,000	
	Monroe	withheld	
	Juneau	withheld	
	Adams	401,000	
		$ 7,142,000	
3	Vernon	withheld	
	Crawford	799,000	
	Richland	withheld	
	Sauk	withheld	
	Columbia	4,131,000	
	Iowa	494,000	(1973)
		$ 5,429,000	
	TOTAL	$13,866,000	

Loading Cars With Quartzite From the Baraboo Range
Sauk County, Plan Area 3

LAND RESOURCES

Land Resource Areas

The Wisconsin River Basin is in three of the 20 national land resource regions: the Northern Lake States Forest and Forage Region (K), Lake States Fruit, Truck and Dairy Region (L), and Central Feed Grains and Livestock Region (M). These three regions consist of the five land resource areas shown in the map following page 12.

Soil Associations and Suitability

Soils within the Basin have been used in part to determine USDA Land Resource Regions and Major Land Resource Areas. A generalized soils map of the Basin precedes page 13.

K - Northern Lake States Forest and Forage Region

90 - Central Wisconsin Thin Loess and Till (27% of Basin) -- Soils in this area consist of a thin layer of silty material overlying acid glacial till. There are many depressional areas occupied by lakes and poorly drained mineral and organic soils. In the Basin, these soils are best suited for dairying with some cash cropping.

91 - Wisconsin Sandy Outwash (24% of Basin) -- This area consists of sandy soils underlain by sandy glacial outwash. Some soils have a high water table. Thin to moderately deep organic soils over sand occur in many of the depressional areas. This association of soils is most suitable for general farming and vegetable crop production with and without irrigation.

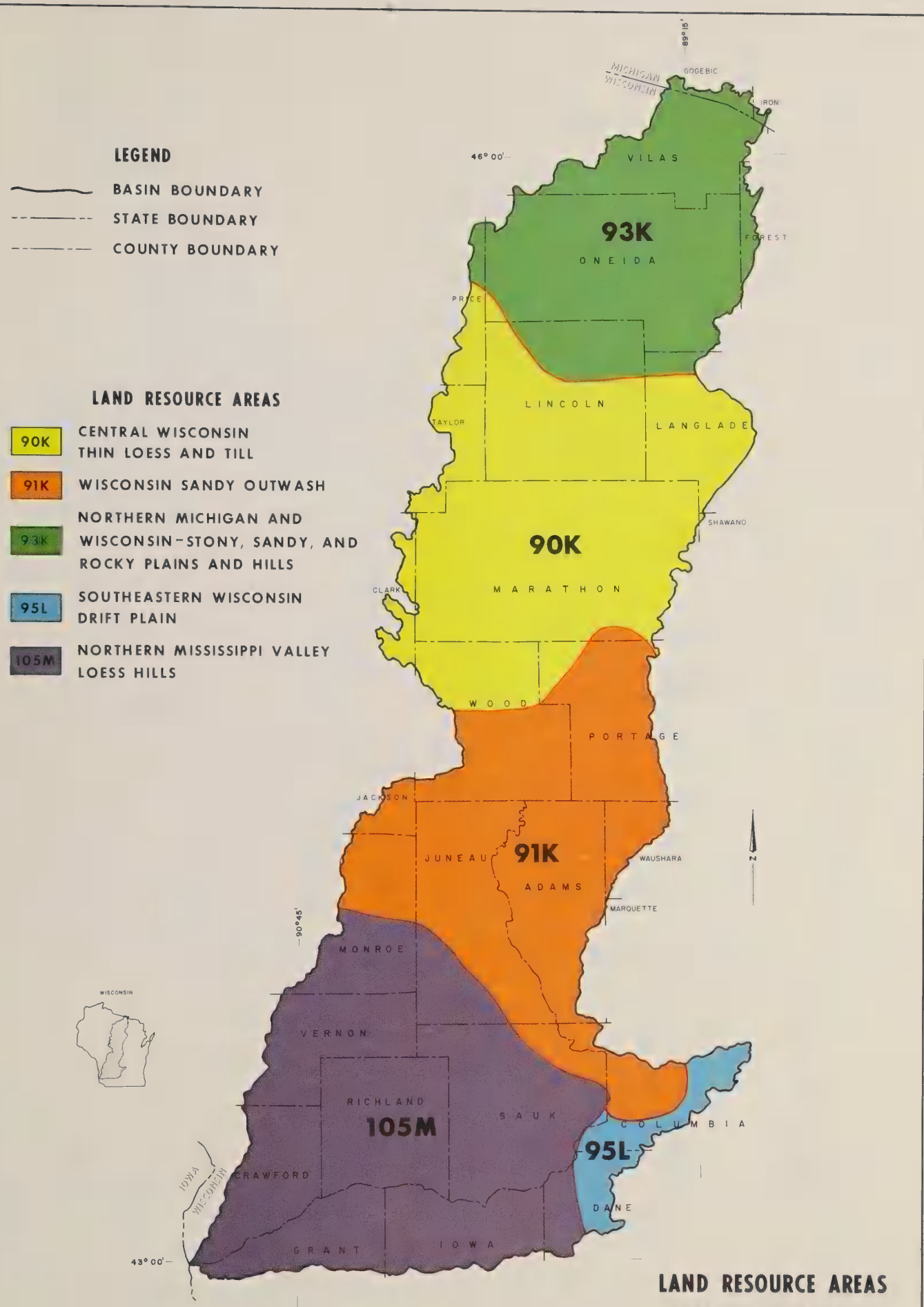
93 - Wisconsin-Stony, Sandy, and Rocky Plains and Hills (17% of Basin) -- The soils in this area consist of thin layers of silty material underlain by sandy and loamy glacial drift. Many areas are stony and rocky. Extensive depressional areas occur in this area, and they are occupied by lakes, wet mineral, and organic soils. A high percentage of this area is in woodland. Some of the soils may be farmed.

L - Lake States Fruit, Truck, and Dairy Region

95 - Southeastern Wisconsin Drift Plain (3% of Basin) -- Soils in this area consist of a layer of silty material over loamy glacial drift. Wet mineral and organic soils occupy the depressional areas. These soils are most suitable for general farming, dairying, and cash cropping to feed grain production.

M - Central Feed Grains and Livestock Region

105 - Northern Mississippi Valley Loess Hills (29% of Basin) -- Soils in this area consist of a layer of silt or sand over bedrock, residuum from bedrock, or sandy and loamy outwash. On steep slopes bordering the major valleys, the land is steep, stony, and rocky.



LAND RESOURCE AREAS
WISCONSIN RIVER BASIN
WISCONSIN AND MICHIGAN

U.S. DEPARTMENT OF AGRICULTURE

URCE:
AMILY OF MAPS SCS DRAWING NO. 5,R-32,569 (2-74) AND
USTIN, M.E. 1972 LAND RESOURCE REGIONS AND MAJOR LAND
ESOURCE AREAS, AGRICULTURAL HANDBOOK 296, S C S, USDA.
RANSVERSE MERCATOR PROJECTION.
SDA-SCS-LINCOLN, NEBR. 1977

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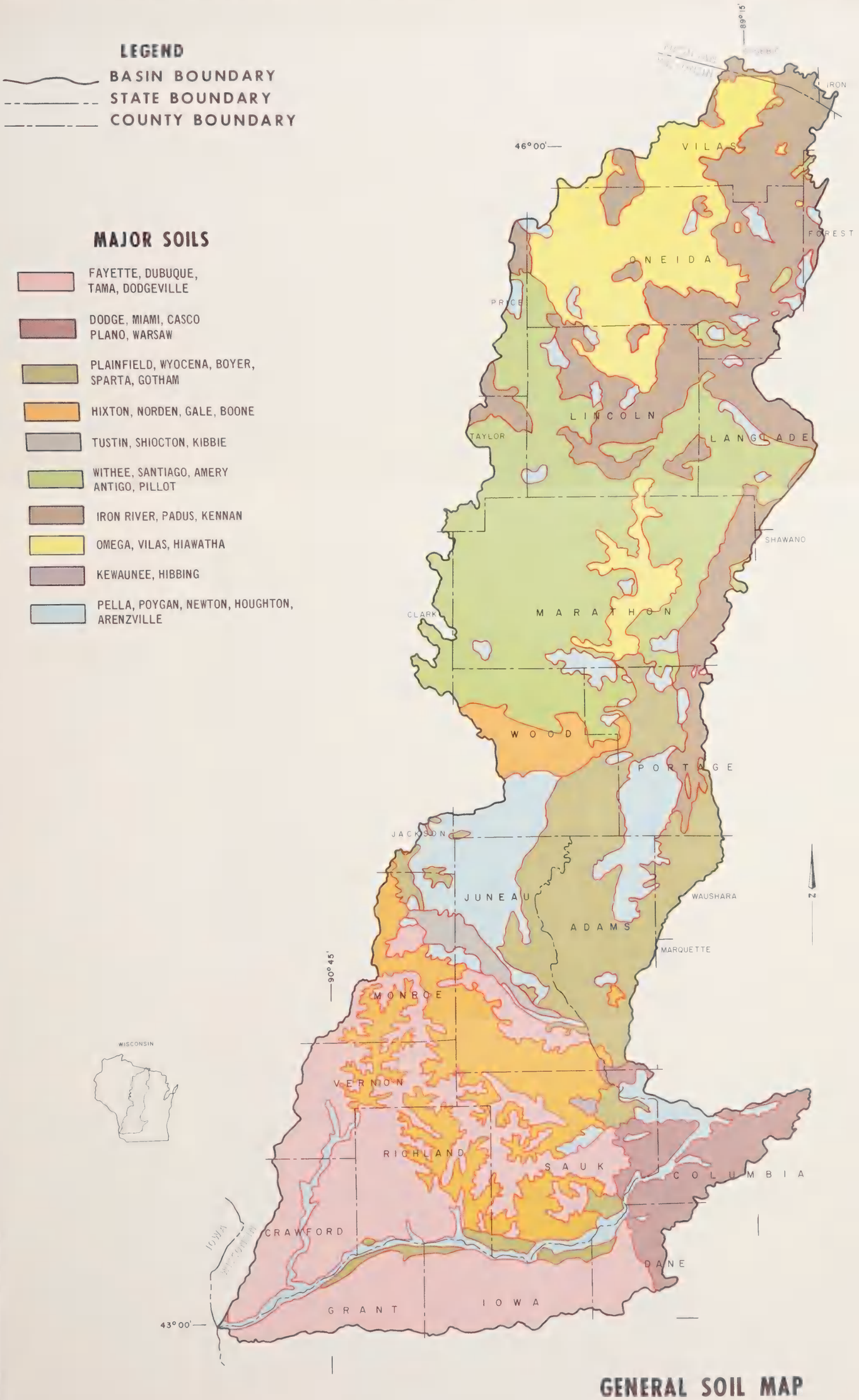

LEGEND
BASIN BOUNDARY
STATE BOUNDARY
COUNTY BOUNDARY
MAJOR SOILS
FAYETTE, DUBUQUE, TAMA, DODGEVILLE
DODGE, MIAMI, CASCO PLANO, WARSAW
PLAINFIELD, WYOCENA, BOYER, SPARTA, GOTHAM
HIXTON, NORDEN, GALE, BOONE
TUSTIN, SHIOCTON, KIBBIE
WITHEE, SANTIAGO, AMERY ANTIGO, PILLOT
IRON RIVER, PADUS, KENNAN
OMEGA, VILAS, HIAWATHA
KEWAUNEE, HIBBING
PELLA, POYGAN, NEWTON, HOUGHTON, ARENZVILLE
89°15'
46°00'
90°45'
43°00'
IRON
VILAS
FOREST
ONEIDA
PRICE
LINCOLN
TAYLOR
LANGLADE
SHAWANO
CLARK
MARATHON
WOOD
PORTAGE
JACKSON
JUNEAU
WAUSHARA
ADAMS
MARQUETTE
MONROE
VERNON
RICHLAND
SAUK
COLUMBIA
CRAWFORD
DANE
GRANT
IOWA
IOWA
WISCONSIN
N
GENERAL SOIL MAP
WISCONSIN RIVER BASIN
WISCONSIN AND MICHIGAN
U.S. DEPARTMENT OF AGRICULTURE
SOURCE:
FAMILY OF MAPS SCS DRAWING 5,P-32,569(2-74), AFTER FRANCIS D. HOLE 1974, UNIVERSITY OF WISCONSIN-EXTENSION, GEOLOGICAL AND NATURAL HISTORY SURVEY, USDA SCS AND FS, AND THE UNIVERSITY OF WISCONSIN.
TRANSVERSE MERCATOR PROJECTION.
1/1,000,000
SCALE
0 5 10 15 20 25 MILES
0 5 10 15 20 25 30 35 KILOMETERS
Rev. 7-7-78
5,0-36,573
USDA-SCS-LINCOLN, NEBR. 1978

Land Use Distribution

Distribution of land by major use is shown on table A-3. Forest land accounts for 42 percent with large forested tracts located throughout the central and northern part of the Basin. Cropland and grassland make up 42 percent and are scattered in the central and southern part of the Basin. The remaining 16 percent is urban land and other. The "other" category consists of farmsteads, roads, mine dumps, homes, land not otherwise listed, and water.

Land Management and Ownership Patterns

About 96 percent of the Basin land area is in the State of Wisconsin, and 4 percent is in the State of Michigan.

Land ownership is predominantly private in the southern two-thirds of the Basin. Federal, State and county land make up a considerable part of the northern Basin land. State-owned lands are scattered throughout the Basin.

AIR QUALITY

Air quality in the Wisconsin River Basin is excellent, and any problems are usually of a local nature and of short duration. Air quality problems may occur in larger cities during periods of unusual weather and on congested highways.

An annoying form of poor air quality, characterized by a noticeable sulfide odor, may occur near papermills. Particulate matter from large coal-fired powerplants is monitored by the Department of Natural Resources.

Before a crop foliage covers tilled fields in the central portion of the Basin, Plan Area 2, wind erodes and transports inorganic and organic soil particles and fertilizers redepositing them when wind velocity decreases.

Forest fires release large quantities of hydrocarbon into the air. The occurrence of these fires is more prevalent during periods of drought.

The Department of Natural Resources is working with counterpart agencies in Illinois and Indiana to develop a regional strategy for controlling air pollution. Photochemical oxidants, hydrocarbons, and nitrous oxide exposed to sunlight are transported to Milwaukee and Racine Counties from heavy industry in the Chicago and Gary areas. These combined with high auto exhaust concentrations create a regional air pollution problem with a possible halo effect in the Wisconsin River Basin.

Table A-3 Land Use By Plan Area[1/]
Wisconsin River Basin

	Plan Area 1	Plan Area 2	Plan Area 3	Basin
	----------1000 acres----------			
Cropland	91.1	1,087.6	1,300.6	2,479.3
Pasture land	80.8	465.4	474.2	1,020.4
Forest land	1,399.8	1,455.4	723.2	3,578.4
Other	153.4	243.9	135.0	532.3
Urban	87.6	161.6	123.8	373.0
Water and federal owned land	202.6	196.6	69.4	468.6
TOTAL	2,015.3	3,610.5	2,826.2	8,452.0

[1/] The data are based upon county line boundaries selected to approximate the hydrologic boundaries.

Diversified Land Use, Plan Area 3

WATER RESOURCES

The Wisconsin River Basin contains abundant water of good quality. Major uses of surface water are for power generation, recreation, fish and wildlife habitat, and industrial and agricultural use. Municipal and rural potable water supply is, with few exceptions, obtained from ground water.

The Upper Wisconsin Subbasin contains numerous lakes while the Central Wisconsin Subbasin has many wetlands. For the purposes of this analysis, the Basin was divided into six hydrologic subbasins shown on the map, following page 16. The subbasins were further divided into watersheds and are shown on the watershed map preceding page 17.

The surface water flowing from the Lower Wisconsin Subbasin is estimated to average 6.75 million acre feet (AF)(8.33 trillion cu m) annually. Ground water provides a considerably larger but less easily utilized water reserve.

Surface Water

The map preceding page 17 shows the drainage pattern of the Basin and the major streams and rivers. The quantity of surface waters is summarized in table A-4. Vilas and Oneida Counties have the greatest total acreage of natural waters.

Surface water streamflow, lake-stage, and water quality measurements are monitored at over 200 locations by the U. S. Geological Survey, Wisconsin Department of Natural Resources, Wisconsin Valley Improvement Company, municipalities, and some industrial users.

Streams

The Upper Wisconsin Subbasin contains about 1,500 miles (2,414 km) of perennial streams. The streams are characterized by generally similar flow-duration characteristics reflecting similarity of ground water conditions and naturally controlled release by more than 2,000 lakes and reservoirs. The relatively uniform flow of the main stem in the central subbasin results in part from these storage features.

Greater variation in streamflow occurs in the tributaries to the main stem in the central subbasins than in the Upper Wisconsin Subbasin. Streamflow is greatest in spring after snowmelt and spring rains, and lowest in winter when precipitation is stored as snow. Floodflows of the main stem are modulated by the numerous storage reservoirs of power dams.

In the Lower Wisconsin, Kickapoo, and Baraboo Subbasins, high peak floodflows occur during intense summer rainfall. The gradient of the lower reaches of the major streams in this portion of the Basin is generally less than 2.0 feet per mile (0.38 m/km), while 20 feet per mile (3.8 m/km) is common in upper reaches.

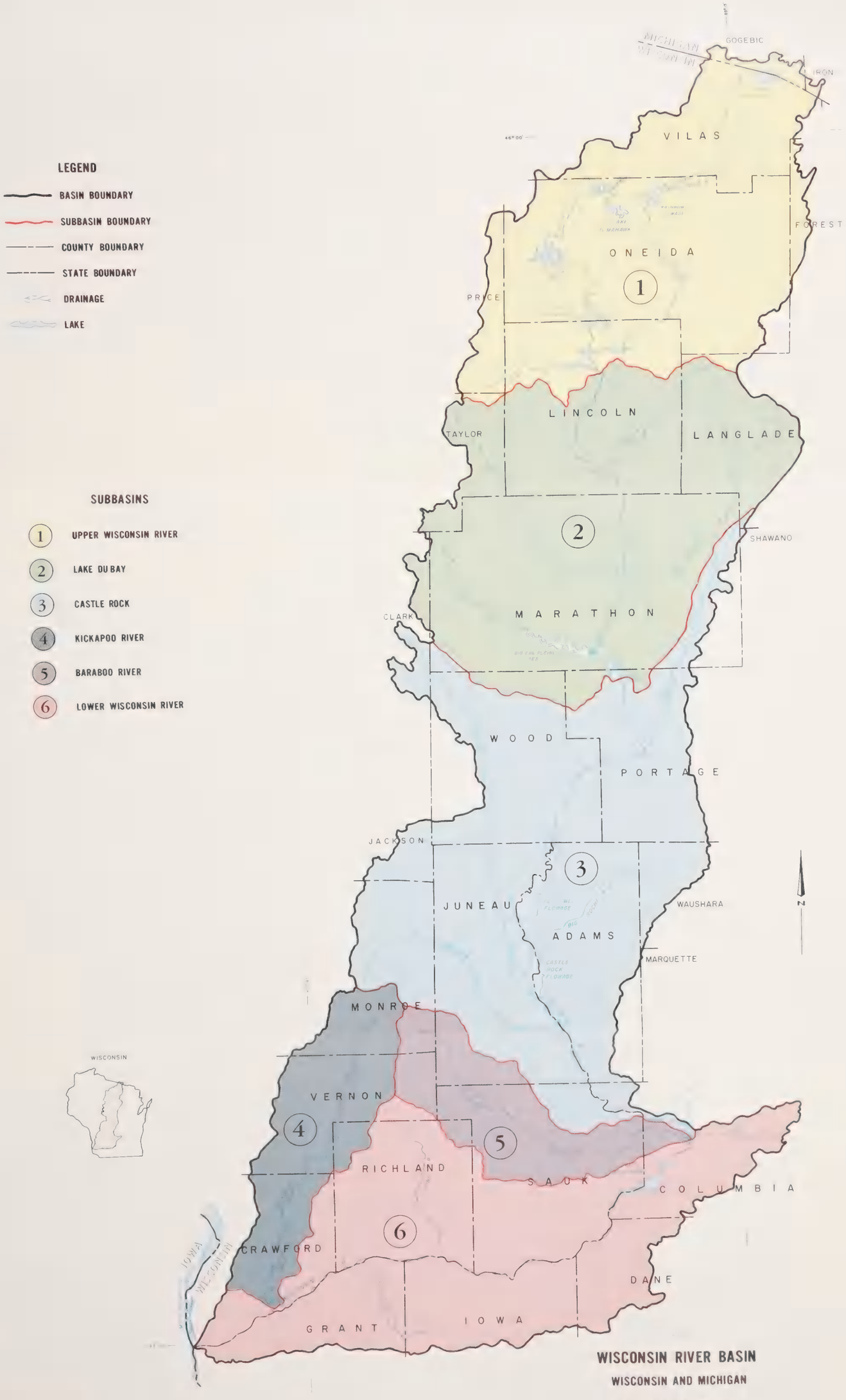
Table A-4

Surface Water Resources
Wisconsin River Basin

County	Natural Lakes & Impoundments (Surface Acres)	Perennial Streams (Miles)	Perennial Streams (Surface Acres)	Total Surface Water (Acres)
Plan Area 1				
Vilas	92,200	400	1,300	93,500
Oneida	69,900	830	4,000	73,900
Lincoln 1/	12,200	670	2,600	14,800
Totals	174,300	1,900	7,900	182,200
Plan Area 2				
Marathon 1/	26,300	950	3,700	30,000
Wood	5,700	400	1,500	7,200
Portage	4,900	430	1,700	6,600
Juneau 2/	44,300	380	3,100	47,400
Adams	2,000	240	400	2,400
Monroe	3,200	180	700	3,900
Totals	86,400	2,580	11,100	97,500
Plan Area 3				
Vernon	200	430	800	1,000
Richland	400	490	4,800	5,200
Sauk 1/	5,300	440	4,100	9,400
Columbia 1/	11,300	320	12,000	23,300
Crawford	200	280	3,200	3,400
Iowa	500	600	6,200	6,700
Totals	17,900	2,560	31,100	49,000
BASIN TOTALS	278,600	7,040	50,100	328,700

1/ Flowages on the Wisconsin River account for significant portions of the total surface water area of Columbia, Marathon, Lincoln, and Sauk Counties as well as Juneau.

2/ Figures for Juneau County include the Petenwell and Castle Rock flowages which form a common boundary between Juneau and Adams Counties.



WISCONSIN RIVER BASIN

WISCONSIN AND MICHIGAN

HYDROLOGIC MAP

U.S. DEPARTMENT OF AGRICULTURE

Economics, Statistics, and Cooperatives Service
Forest Service, and Soil Conservation Service

SCALE 1:1,000,000

SCALE 0 5 10 15 20 25 MILES
0 5 10 15 20 25 30 35 40 KILOMETERS

SOURCE:
FAMILY OF MAPS SCS DRWG. NO. 5,R-32,569 11-75
AND INFORMATION FROM FIELD TECHNICIANS.
TRANSVERSE MERCATOR PROJECTION

Rev 2-7-79
5,S-36,467

U S DEPARTMENT OF AGRICULTURE

CONSERVATION NEEDS INVENTORY
WATERSHED MAP
WISCONSIN RIVER BASIN
WISCONSIN AND MICHIGAN

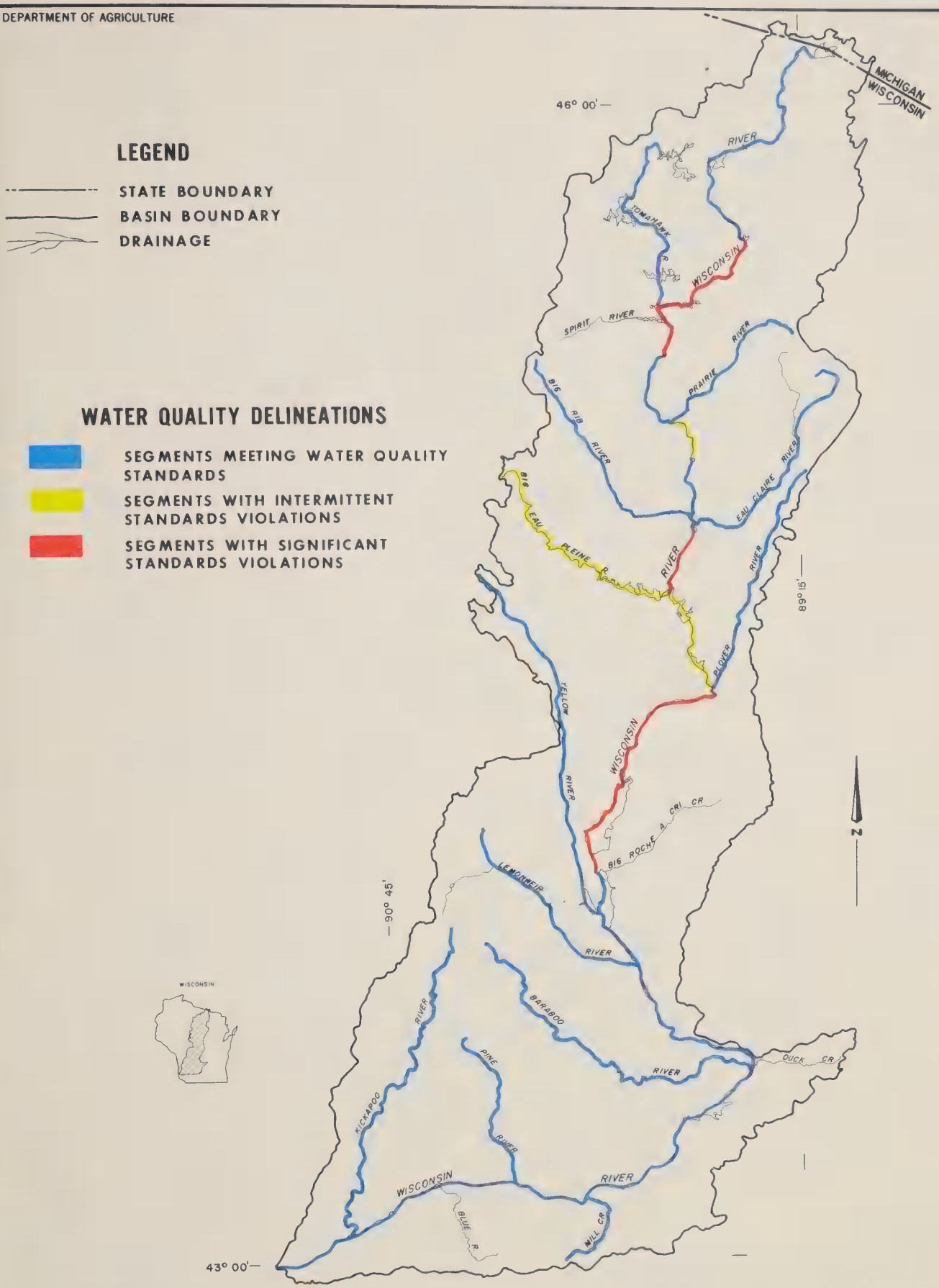
SCALE 1/1,000,000

SCALE 0 5 10 15 20 25 MILES
0 5 10 15 20 25 30 35 KILOMETERS

SOURCE
FAMILY OF MAPS SCS DRWG NO 5, R-32,569 (2-79)
AND INFORMATION FROM FIELD TECHNICIANS
TRANSVERSE MERCATOR PROJECTION
USDA-SCS LINCOLN NEBR 1979

Rev. 2-1-79
5,R-32,569.8

U. S. DEPARTMENT OF AGRICULTURE



WATER QUALITY STATUS

WISCONSIN RIVER BASIN

WISCONSIN AND MICHIGAN

U.S. DEPARTMENT OF AGRICULTURE

SOURCE:
WISCONSIN DEPARTMENT OF NATURAL RESOURCES
1976 WATER QUALITY INVENTORY REPORT TO CONGRESS
WISCONSIN RIVER BASIN-WATERSHED PLANNING STAFF
FAMILY OF MAPS SCS DRAWING NO. 5, R-32,569 (2-74)
TRANSVERSE MERCATOR PROJECTION

USDA-SCS-LINCOLN, NEBR. 1978

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SCALE 5 0 5 10 15 20 MILES

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5,0-36,669

BACKGROUND WATER QUALITY
pH

- pH LESS THAN 7.2 STANDARD UNITS
- pH 7.2 - 8.2 STANDARD UNITS

BACKGROUND WATER QUALITY
HARDNESS

- SOFT WATER STREAMS
  LESS THAN 50 mg/l $CaCO_3$
- MEDIUM HARDNESS
  50 - 100 mg/l $CaCO_3$
- HARD WATER STREAMS
  GREATER THAN 100 mg/l $CaCO_3$

BACKGROUND WATER QUALITY
TOTAL ORGANIC NITROGEN

- LOW LESS THAN 0.4 mg/l
- MODERATE 0.4 - 1.0 mg/l
- HEAVY GREATER THAN 1.0 mg/l

N

LEGEND

- BASIN BOUNDARY
- DRAINAGE

BACKGROUND WATER QUALITY
TOTAL PHOSPHOROUS

- LOW LESS THAN 0.1 mg/l
- MODERATE 0.1 - 0.3 mg/l

BIOLOGICAL COMMUNITIES

- CLEAN STREAM COMMUNITIES
- POLLUTED STREAM COMMUNITIES

AQUATIC NUISANCE CONDITIONS

- MOSTLY FREE OF AQUATIC NUISANCE
- EXCESSIVE ALGAE OR PLANT GROWTH
- SLIMES, ODORS, AND OTHER AESTHETIC DEGRADATION

WISCONSIN

SOURCE:
WISCONSIN DEPARTMENT OF NATURAL RESOURCES
STATE WATER QUALITY INVENTORY REPORT TO CONGRESS
FAMILY OF MAPS SCS DRAWING NO 5,R-32,569
TRANSVERSE MERCATOR PROJECTION

1/3,326,000

SCALE 25 0 25 50 75 100 MILES

WATER QUALITY INDICATORS

WISCONSIN RIVER BASIN

WISCONSIN AND MICHIGAN

U.S. DEPARTMENT OF AGRICULTURE

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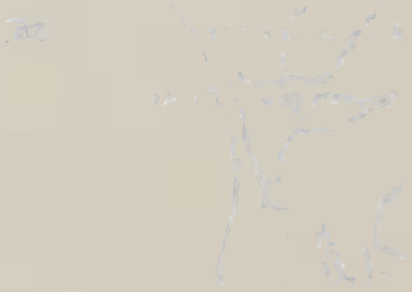


Lakes and Ponds

Lakes of the Upper Wisconsin Subbasin are extensively used for recreation. Numerous resorts and parks provide public access to good fishing and water recreation. There is good vegetative cover in adjacent wetlands and forests. In the Lake DuBay and Castle Rock Subbasins, many lakes occur along the eastern watershed divide. Lake levels coincide with the water table which fluctuates with precipitation trends. Much of the Castle Rock Subbasin is covered by wetlands. The Necedah National Wildlife Refuge, about 72,000 acres (29,100 ha), is within this vast wetlands area. The main stem of the Wisconsin River provides more than 56,000 acres (22,700 ha) of closely controlled reservoir and lake surface. In the Lower Wisconsin, Kickapoo, and Baraboo Subbasins, there are few natural lakes. Several manmade reservoirs have been constructed for wildlife habitat, recreation, and hydroelectric power generation.

Surface Water Quality

State water quality standards have been prepared by the Wisconsin Department of Natural Resources for a variety of uses including fish, aquatic life, and recreation. The quality of water is probably best described in terms of specific bodies of water and its ability or inability to meet standards for specific water uses.

On the main stem of the Wisconsin River and its tributaries, water quality is generally adequate for fish and aquatic life. Water quality problems do occur on some segments of the river usually during low-flow periods in summer and early autumn. See the Water Quality Status Map preceding page 17 for details.

Water quality problems usually occur within one or two miles of a point source of pollution. Common point sources of pollution are industrial plants and municipal waste water plants. The major problems on the main stem in the past have occurred at, and downstream from, pulp and papermills. At present, all the mills are meeting the discharge requirements of their permits. Some pollution problems do exist during extreme low-flow conditions. However, according to the U. S. Environmental Protection Agency these problems will be rectified by 1983 and there will be no pollution problems from the pulp and paper mills by 2000.

Other water quality problems result from nonpoint pollution sources which provide heavy nutrient, sediment, and pesticide loadings. A major nonpoint source is highly utilized agricultural land where soils and topography promote rapid surface runoff. Forestry-related nonpoint source pollution is minimal. In a few isolated cases logging activities do contribute to nonpoint source pollution. Most of these occur on the steep topography of the Driftless Area in Plan Area 3. Forestry activities are much less prevalent here than elsewhere in the Basin so the problem is minimal. The employment of best management practices in logging operations is recommended for the Driftless Area of Plan Area 3 and at other sites in the Basin where and when needed.

Urban areas are another nonpoint source where soils and topography prevent efficient septic tank operation. High ground water is a frequent problem associated with efficient septic tank operations.

Water in the Upper Wisconsin Subbasin surface is soft, typically containing 0-60 milligrams per liter (mg/l) of calcium carbonate. ($CaCO_3$). Streams of this Subbasin draining wetlands are often dark brown in color due to organic materials. Water in the Lake DuBay and Castle Rock Subbasins contain dissolved solids which vary seasonally with flow from less than 90 mg/l to about 280 mg/l. The water temperature varies from 0° Celsius (C.) in winter to about 29°C. in summer. The water quality of the Lower Wisconsin, Kickapoo, and Baraboo Subbasins is characterized by high hardness varying typically from about 60 to 125 mg/l $CaCO_3$. Dissolved solids typically vary from less than 85 mg/l to over 400 mg/l. See Water Quality Indicators preceding page 17 for details.

Ground Water

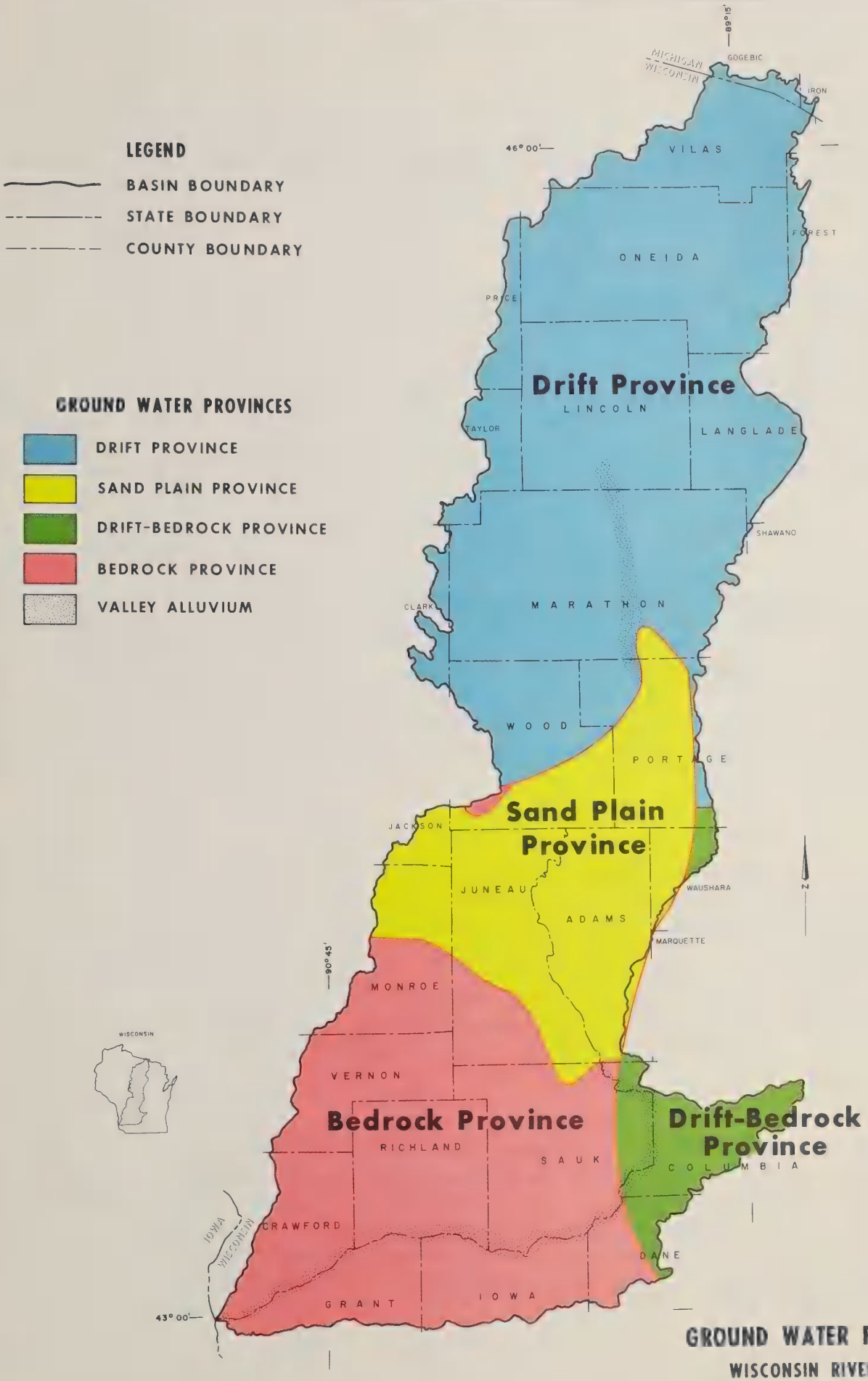
Ground water for municipal, industrial, and rural use is becoming more important with urban expansion and increase in population and growth of industry. The amount and quality of ground water available varies with ground water province and type of aquifer. The northern one-half of the Basin depends on a sand and gravel aquifer of glacial deposits and recent alluvium overlying bedrock. The quantity of water ranges from a low yield of 0-10 gallons per minute (gpm) (0.6 liter/second - l/sec) to a high yield of over 500 gpm (31 l/sec). The area has soft water, both from surface and bedrock wells. Water supply in a particular locale may be deficient because of the variable thickness of glacial deposits and occasional buried ridges of Precambrian crystalline rock with a relief of several hundred feet.

There are four ground water provinces: Drift Province, Sand Plain Province, Drift-Bedrock Province, and Bedrock Province. Distribution of provinces by plan area are shown in table A-5. The ground water provinces map follows page 18.

Table A-5 Ground Water Provinces
Wisconsin River Basin

Plan Area	Bedrock Province	Sand Plain Province	Drift-Bedrock Province	Drift Province
1	-	-	-	100%
2	11%	45%	-	44%
3	84%	1%	15%	-

Probable well yields from glacial and bedrock deposits are highly variable. Detailed maps showing probable well yield in the Wisconsin aquifers have been published as a cooperative project by the University of Wisconsin Extension -


LEGEND
BASIN BOUNDARY
STATE BOUNDARY
COUNTY BOUNDARY
GROUND WATER PROVINCES
DRIFT PROVINCE
SAND PLAIN PROVINCE
DRIFT-BEDROCK PROVINCE
BEDROCK PROVINCE
VALLEY ALLUVIUM
89°15'
MICHIGAN
WISCONSIN
GOGEBIC
IRON
46° 00'
VILAS
FOREST
ONEIDA
PRICE
Drift Province
LINCOLN
TAYLOR
LANGLADE
SHAWANO
CLARK
MARATHON
WOOD
PORTAGE
Sand Plain Province
JACKSON
JUNEAU
ADAMS
WAUSHARA
MARQUETTE
N
90° 45'
MONROE
WISCONSIN
VERNON
Bedrock Province
RICHLAND
SAUK
Drift-Bedrock Province
COLUMBIA
IOWA
WISCONSIN
CRAWFORD
DANE
GRANT
IOWA
43° 00'
GROUND WATER PROVINCES
WISCONSIN RIVER BASIN
WISCONSIN AND MICHIGAN
U.S. DEPARTMENT OF AGRICULTURE
SOURCE:
FAMILY OF MAPS SCS DRAWING NO. 5,R-32,569 (2-74) AND INFORMATION SUPPLIED BY UNIVERSITY OF WISCONSIN EXTENSION-GEOLOGICAL AND NATURAL HISTORY SURVEY.
TRANSVERSE MERCATOR PROJECTION.
USDA-SCS-LINCOLN, NEBR. 1977
SCALE 1/1,700,000
SCALE 5 0 5 10 15 20 MILES
10-1-77
5,0-35,369

Geological and Natural History Survey and the United States Geological Survey. The stratigraphic units, their water-bearing characteristics, and the province in which the units are found are summarized on page 20. Probable well yield maps - Bedrock and Glacial Deposits - follow page 20.

Drift Province

Pitted and unpitted outwash, ground moraine, and end moraine of Pleistocene age make up aquifers in the Drift Province. Glacial drift overlies crystalline Precambrian rock, yielding small amounts of water - 0 to 10 gpm (0-0.6 l/sec) - where deeply weathered or extensively creviced. Depth to water table varies. General ranges are 20-30 feet (6-9 m) in the area of ground moraine, 50-100 feet (15-30 m) in pitted outwash and up to 170 plus feet (52 m) in end moraines. This province covers the northern half of the Basin. The probable well yield from the glacial deposits varies from 10 to over 500 gpm (0.6-31 l/sec).

Sand Plain Province

Aquifers in this province are of Upper Cambrian Sandstone and unconsolidated glacial outwash. Probable well yield from bedrock is 100 to 500 gpm (6-31 l/sec). The lakebed of Glacial Lake Wisconsin overlies much of this area. Shallow depths to water table are common. The Sand Plain Province covers a significant part of the central portion of the Basin but less than one-quarter of the entire Basin. Probable well yields range from 10 to greater than 500 gpm (0.6-31 l/sec). About 75 percent of the area will have a probable yield of over 500 gpm (31 l/sec).

Bedrock Province

The most important bedrock aquifers are the St. Peter Sandstone, Prairie du Chien Group of dolomite and sandy dolomite, and Upper Cambrian Sandstone. Upper Cambrian Sandstone has the highest capacity and water yield. Probable well yields from the bedrock are in excess of 500 gpm (31 l/sec). Ground water is also derived from the Galena-Platteville dolomite-shale-limestone aquifer and from crevices in Precambrian crystalline or metamorphic rocks. Sand and gravel aquifers are present in the Wisconsin River Valley alluvium. Most of the southern one-third of the Basin is in this province.

Drift-Bedrock Province

The bedrock consists mainly of Cambrian Sandstone with small areas covered by the Prairie du Chien Group with probable well yields of over 500 gpm (31 l/sec). The glacial deposits that overlie bedrock are end moraine, ground moraine, and outwash. The Cambrian Sandstone aquifer is the highest yielding. The aquifers of unconsolidated deposits have shallower water tables but lower yields, averaging 10 to 100 gpm (0.6-6 l/sec). Along the southeast boundary of this province, the yield from glacial deposits is 0 to 10 gpm (0-0.6 l/sec).

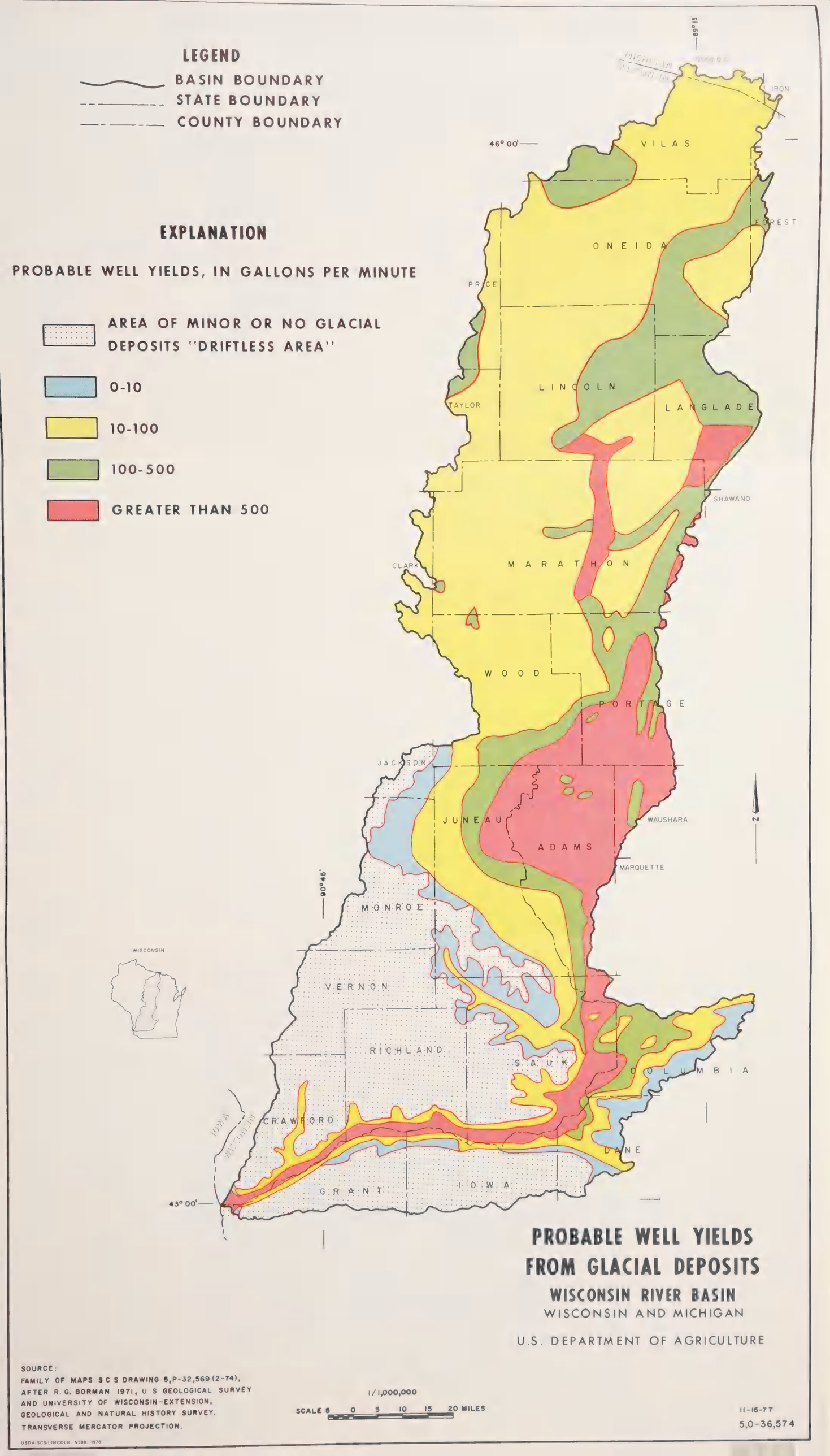
STRATIGRAPHIC UNITS AND THEIR WATER-BEARING CHARACTERISTICS
Wisconsin River Basin

SYSTEM	GROUP OR FORMATION	THICKNESS IN FEET	CHARACTER	WATER-BEARING CHARACTERISTICS	PROVINCE 1/			
					Drift	Sand Plain	Drift-Bedrock	Bedrock
Quaternary	Recent Alluvium	0-100	Sand, gravel, peat, muck, marl	Small to large yields from sand and gravel	X	X	X	X
	Pleistocene Deposits	0-300	Boulder, clay, silt, sand, gravel		X	X	X	X
Cretaceous	Windrow	0-30	Terrace gravels	Not determined				X
Silurian	Edgewood Dolomite 2/ Blue Mounds Outlier, Iowa Co.	0-150	Siliceous cherty, limestone and dolomite	Not an aquifer because of small size and is unsaturated				X
Ordovician	Maquoketa Shale 3/ Blue Mounds Outlier Dane & Iowa Co.	0-130	Dolomitic shale	Not an aquifer because of small size and low permeability				X
	Galena Dolomite Decorah Shale Platteville Limestone	0-350	Dolomite and limestone, some shale	Yields small amounts of water				X
	St. Peter Sandstone	0-330	Sandstone, fine to medium-grained, massive	Yields small to medium amounts of water				X
	Shakopee Dolomite Oneota Dolomite	0-200	Dolomite, sandy in some zones	Yields small amounts of water			X	X
Upper Cambrian	Jordan Sandstone St. Lawrence Formation Franconia Sandstone Galesville Sandstone Eau Claire Sandstone Mount Simon Sandstone	0-1000+	Fine to coarse-grained sandstone, dolomitic, some shale and dolomite beds	Yields small to large amounts of water depending upon permeability & thickness		X	X	X
Precambrian		Thickness varies; total thickness unknown but in excess of 5,000 feet	Quartzite, slate, granite and other crystalline rocks	Yields small amounts of water where crevviced or weathered	X	X	X	X

1/ See Ground Water Provinces Map.
2/ Aerial extent less than one square mile.
3/ Aerial extent less than two square miles.

SOURCE OF DATA: University of Wisconsin Extension - Geological and Natural History Survey, USGS, and field information.

LEGEND
BASIN BOUNDARY
STATE BOUNDARY
COUNTY BOUNDARY
EXPLANATION
PROBABLE WELL YIELDS, IN GALLONS PER MINUTE
0-10
10-100
100-500
GREATER THAN 500
90° 15'
SOGEBIC
IRON
46° 00'
VILAS
FOREST
ONEIDA
PRICE
LINCOLN
TAYLOR
LANGLADE
SHAWANO
CLARK
MARATHON
WOOD
PORTAGE
JACKSON
JUNEAU
WAUSHARA
ADAMS
MARQUETTE
90° 45'
MONROE
WISCONSIN
VERNON
RICHLAND
SAUK
COLUMBIA
IOWA
WISCONSIN
CRAWFORD
DANE
GRANT
IOWA
43° 00'
N
PROBABLE WELL YIELDS
FROM BEDROCK
WISCONSIN RIVER BASIN
WISCONSIN AND MICHIGAN
U.S. DEPARTMENT OF AGRICULTURE
SOURCE:
FAMILY OF MAPS S C S DRAWING 5,P-32,569(2-74),
AFTER R.G. BORMAN 1971 & R. W. DEVAUL 1975,
U S GEOLOGICAL SURVEY AND UNIVERSITY OF WISCONSIN-
EXTENSION, GEOLOGICAL AND NATURAL HISTORY SURVEY.
TRANSVERSE MERCATOR PROJECTION.
1/1,000,000
SCALE 5 0 5 10 15 20 MILES
11-18-77
5,0-36,575
USDA-SCS-LINCOLN, NEBR 1978


LEGEND
BASIN BOUNDARY
STATE BOUNDARY
COUNTY BOUNDARY
EXPLANATION
PROBABLE WELL YIELDS, IN GALLONS PER MINUTE
AREA OF MINOR OR NO GLACIAL DEPOSITS "DRIFTLESS AREA"
0-10
10-100
100-500
GREATER THAN 500
89° 15'
46° 00'
90° 45'
43° 00'
IRON
VILAS
FOREST
ONEIDA
PRICE
LINCOLN
TAYLOR
LANGLADE
SHAWANO
CLARK
MARATHON
WOOD
PORTAGE
JACKSON
JUNEAU
WAUSHARA
ADAMS
MARQUETTE
MONROE
VERNON
RICHLAND
SAUK
COLUMBIA
CRAWFORD
DANE
GRANT
IOWA
IOWA
WISCONSIN
WISCONSIN
N
PROBABLE WELL YIELDS
FROM GLACIAL DEPOSITS
WISCONSIN RIVER BASIN
WISCONSIN AND MICHIGAN
U.S. DEPARTMENT OF AGRICULTURE
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FAMILY OF MAPS S C S DRAWING 5,P-32,569 (2-74),
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AND UNIVERSITY OF WISCONSIN-EXTENSION,
GEOLOGICAL AND NATURAL HISTORY SURVEY.
TRANSVERSE MERCATOR PROJECTION.
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5,0-36,574
USDA-SCS-LINCOLN, NEBR. 1978

FORESTRY RESOURCES

Forestry

Commercial forest land 1/ totals 3,582,900 acres 2/ (1,450,000 ha) or 42 percent of the plan areas. In addition, there are 90,200 acres (36,500 ha) of noncommercial forest land 3/. The Basin contains 25 percent of the State's forest land. Plan Area 1, comprising 24 percent of the Basin, contains 39 percent of the forest land. Plan Area 2, with 43 percent of the land base, contains 41 percent of the forest land. Plan Area 3 has 33 percent of the land base and contains 20 percent of the Basin's forest land.

The private sector (industry, farmers, and miscellaneous private owners) accounts for 79 percent of all commercial forest land. State, county, and municipal lands comprise 17 percent. The remainder is in Federal ownership. Table A-6 summarizes these distributions. The map following page 24 shows the general forest land distribution for Federal, State, county, and industrial ownership.

Forest Types and Condition

Forest lands are divided into five ecosystems: coniferous, oak-hickory, elm-ash-cottonwood, maple-beech-birch, and aspen-birch. Their distribution is shown in the figure on page 22.

The coniferous ecosystem consists primarily of white, red, and jack pine; hemlock; tamarack; and northern white cedar. The oak-hickory ecosystem consists mostly of white and red oaks, hickory, yellow poplar, black walnut, and black cherry. The elm-ash-cottonwood ecosystem is predominantly elm, green and white ash, and cottonwood. The maple-beech-birch ecosystem is comprised of yellow birch, maples, beech, and basswood. The aspen-birch ecosystem consists basically of balsam poplar, aspens, and paper birch.

1/ Commercial forest land is producing or is capable of producing crops of industrial wood and is not withdrawn from timber utilization by statute or administrative regulation.

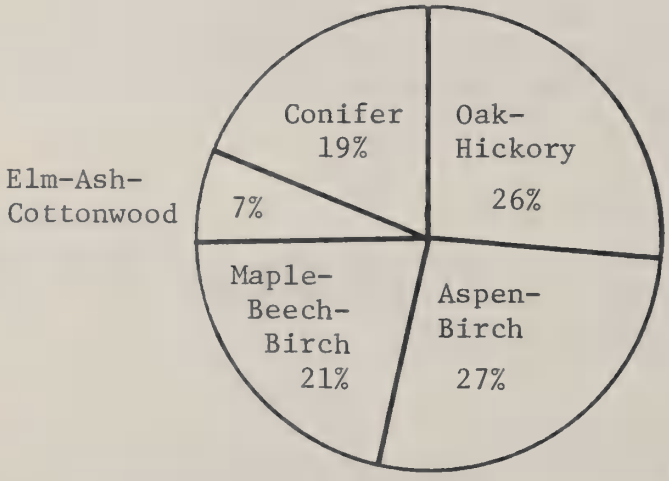
2/ 1968 Survey data.

3/ Noncommercial forest land is incapable of producing crops of industrial wood because of adverse site conditions or is withdrawn from commercial timber use through statute or administrative regulation.

Table A-6 Commercial Forest Land, Acres By Ownership Class, 1968
Wisconsin River Basin

Plan Area	1	2	3	Totals
	---------- 1000 Acres ----------			
National Forest	69.5			69.5
Other Federal:				
Indian	22.3	2.2	0.4	24.9
Misc. Fed.	4.3	41.6	6.9	52.8
State	79.8	58.3	10.6	148.7
County Municipal	251.7	204.2	3.4	459.3
Forest Industry	278.3	58.2	3.9	340.4
Farmer-owned	186.2	656.3	593.0	1435.5
Misc. Private:				
Individual	437.8	393.7	93.1	924.6
Corporate	66.5	43.8	17.0	127.3
Total	1396.4	1458.3	728.3	3583.0

Source: Resource Bulletin NC-15, 1972, North Central Forest Experiment Station, USDA, Forest Service.



Forest Ecosystem Distribution, Wisconsin River Basin

Poletimber stands[1/] constitute 40 percent of the commercial forest. Seedling-sapling stands 2/ make up the next largest category with 32 percent, while sawtimber stands 3/ comprise 25 percent. Sixty-five percent of the stands are medium-stocked 4/ or better. Fifty percent of the forests are less than 40 years old.

Forest uses are varied. Recreation, timber production, wildlife management, and esthetic enhancement occupy a place in today's forest management scheme.

Urban Forestry

Urban forestry programs are confined to three cities, all located in Plan Area 2. The cities of Wisconsin Rapids, Wausau, and Stevens Point have viable urban forestry programs and each employs a forester. These programs concentrate on city park and street trees though technical assistance is also provided to the private landowner.

Dutch Elm disease control receives a major portion of all three cities' forestry efforts. Most of central Wisconsin has been hit hard with the disease but mortality has been held to 3 percent with the sanitation programs in Wausau, Wisconsin Rapids, and Stevens Point.

In conjunction with the elm loss, the cities have initiated a tree planting program. Wisconsin Rapids and Wausau have developed nurseries for storage and growing of replacement trees.

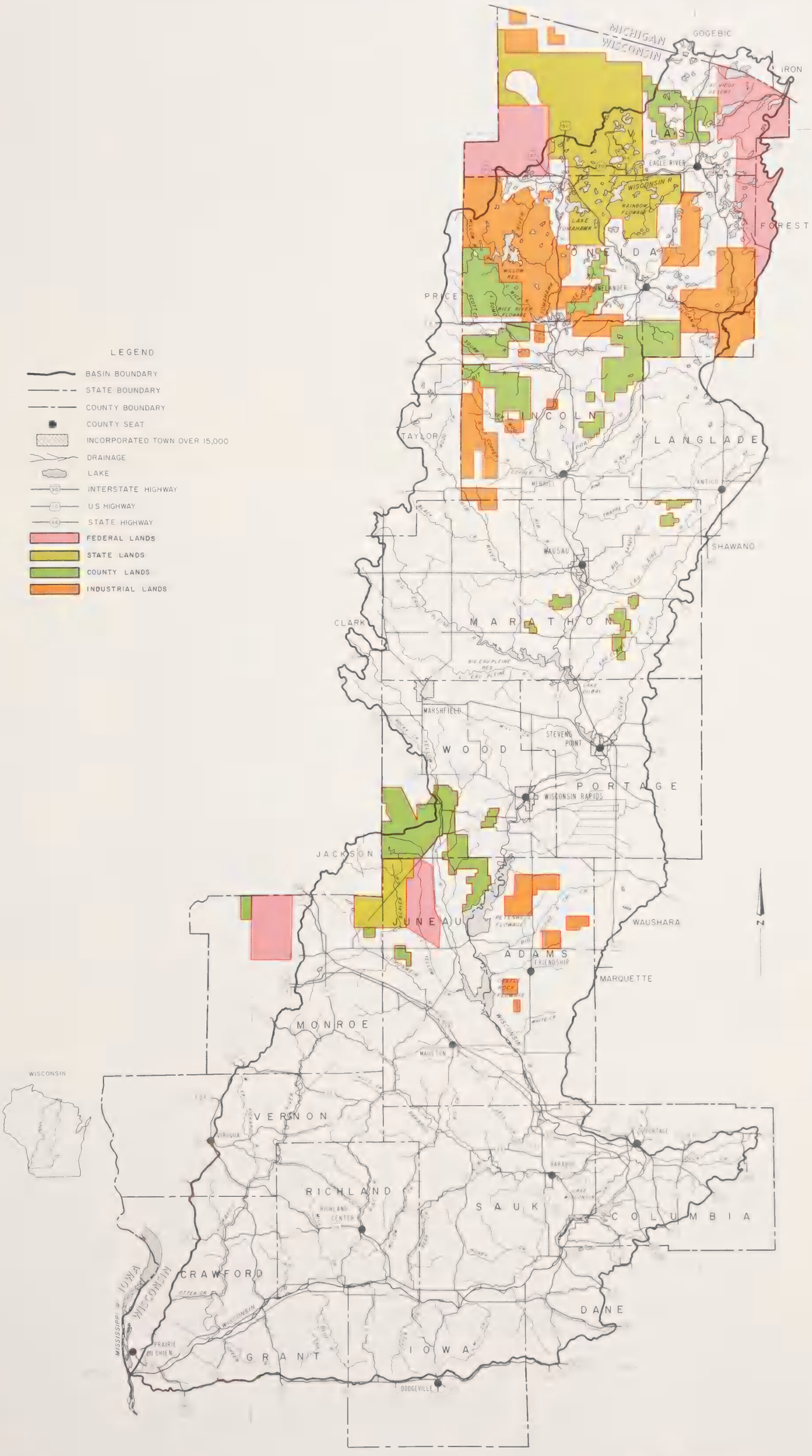
1/ Poletimber stands are dominated by live trees of commercial species at least 5.0 inches in diameter but smaller than sawtimber size.

2/ Seedling-sapling stands are comprised of live trees of commercial species less than 5 inches in diameter with more than half the stocking being seedling-saplings.

3/ Sawtimber stands are dominated by live trees of commercial species with a diameter of 9.0 inches or greater for softwood species and 11.0 inches or greater for hardwood species.

4/ Medium-stocked stands are those with trees occupying 60-100 percent of the available tree space.

White Oak Harvest, Plan Area 3



FOREST LAND OWNERSHIP

WISCONSIN RIVER BASIN

WISCONSIN AND MICHIGAN

SOURCE
FAMILY OF MAPS, SCS DRWG 5,R-32,569.2 (2-79)
AND INFORMATION FROM FIELD TECHNICIANS
TRANSVERSE MERCATOR PROJECTION

Rev 2-7-79
5,0-36,555

USDA-SCS-LINCOLN, NEBR. 1979

FISH AND WILDLIFE RESOURCES

Fish

The Wisconsin River flows through or adjacent to a wide variety of aquatic habitats including oxbow lakes, side channels, slow-moving shallow backwater (slough) areas, swift water environs, and many types of wetlands. Sand is the primary bottom material intermixed with lesser amounts of silt, gravel, rubble, boulders, and exposed bedrock. Common aquatic plants which grow primarily in the shallow backwater areas or along sheltered shorelines include wild rice, pondweed, cattail, arrowhead, watermilfoil, waterlily, spatterdock, and coontail.

The Wisconsin River, with its connnection to the Mississippi River, is a major distribution route for the northward and eastward movement of fishes. With its extensive habitat variation, the river supports a rich diversity of fish species. The watershed area of the Wisconsin River also supports a substantial sport fishery in the 278,600 surface acres (112,700 ha) of natural lakes and impoundments. Over sixty percent of this water occurs in Plan Area 1. Among the more sought-after lake fish are: northern pike, walleye, muskellunge, largemouth bass, various panfish, and channel catfish. The exceptional sizes to which muskellunge grow and the limited amount of available habitat concentrated in northern Wisconsin makes the musky highly valuable.

In general, muskellunge and walleye inhabit the larger lakes while the smaller lakes are often referred to as "bass" lakes. The stability and character of the lake fishery is strongly influenced by the depth of water. Shallow lakes are subject to winterkill which selectively kill intolerant species, many of which are game fish.

Becker (1966) found 82 species representing 20 families in a comprehensive survey of the Lower Wisconsin River below the dam at Prairie du Sac, Sauk County, to its mouth. Marinac and Coble (1976) collected 37 species in a survey of the Upper Wisconsin River above the dam at Prairie du Sac to the river's source. Common warm water game fish prized by sport fishermen are walleye, sauger, perch, muskellunge, northern pike, largemouth and smallmouth bass, white bass, bluegill, crappie, and catfish.

Walleye, sauger, and smallmouth bass often congregate in swift water near rocky shoal areas and in the tailwaters of the hydroelectric dams that impound the river. Muskellunge, northern pike, largemouth bass, and white bass, as well as several panfish species, are found in side channels and shallow backwater areas where aquatic vegetation, stump fields, and other natural substrate provide cover for spawning, nursery, and concealment purposes. Catfish can tolerate turbid or silty conditions and prefer deep holes, undercut banks, or depressions under rocks. The crevices in drift piles and submerged logs are also favorite haunts. Catfish are an important fishery resource in the Lower Wisconsin River. Channel catfish are the most abundant, but flatheads, occasionally in excess of 50 pounds (23 kilogram - kg) are also taken by setline or bank pole methods.

The aquatic environment of the Wisconsin River is also favorable for nongame fish species including carp, bullhead, redhorse, white sucker, gizzard shad, and several species of minnows, especially shiners. The primary importance of these nongame fishes is their contribution to the aquatic food web and overall functioning of the entire aquatic ecosystem.

A substantial cold water fishery also exists within the Wisconsin River Basin. Numerous trout streams draining into the Wisconsin River support brook, brown, and rainbow trout.

Wildlife

The Wisconsin River flows through a variety of terrain including conifer-hardwood swamps, sedge meadows, alder thickets, cattail marshes, flood plain forests, bottomland timber, upland oak forests, oak savannas, and wooded sandstone bluffs. The river winds through broad valleys that border pastured or cultivated agricultural lands and small to large urban areas.

The vegetation of the Basin can be divided into general northern and southern provinces, meeting in Portage County. The northern province is a broadleaf deciduous forest vegetated with sugar maple, yellow birch, spruces, balsam fir, hemlock, and pines. In the southern province, conifers give way to oak forests (white, black, red) and prairies dominated by grasses and tall herbs.

The Wisconsin River Basin, with its diverse habitat, has wildlife resources. Primary wildlife species or groups that inhabit the Basin which have conspicuous esthetic (sight value), economic (trapping) or recreational (hunting, wildlife observation) values are listed below:

Big Game:	White-tailed deer, turkey, and black bear.
Small Game:	Cottontail rabbit, jackrabbit, snowshoe hare, and gray and fox squirrel.
Furbearers:	Muskrat, beaver, raccoon, red and gray fox, coyote, bobcat, skunk, badger, short-tailed and least weasel, mink, and otter.
Upland Game Birds:	Ring-necked pheasant, bobwhite, ruffed and sharp-tailed grouse, prairie chicken, and woodcock.
Waterfowl:	Ducks and geese.
Marsh and Shorebirds:	Sandhill crane, great egret, and great blue heron.
Birds of Prey:	Bald eagle, red-shouldered and red-tailed hawk, osprey, and screech owl.
Songbirds:	Numerous species that have high sight value for bird watchers.

White-tailed Deer, Plan Area 1

There are over 200,000 acres (80,900 ha) of State public hunting lands in the counties that border or include the Wisconsin River. The Wisconsin Department of Natural Resources owns or leases these lands for the purposes of wildlife management, hunting, trapping, fishing, or otherwise wildlife-oriented recreation. Also, large tracts of State and county forests exist in Vilas, Oneida, and Lincoln Counties which contribute substantially to the Basin's wildlife resource base.

Endangered Species

Concern for endangered species has increased in recent years. Protective legislation has been passed at both the Federal and State levels of government. In Wisconsin, fish and wildlife species whose continued existence as a viable component of the State's wild fauna is in jeopardy, are protected by State law. To date, no State laws offer protection to endangered plants. Knowledge of the distribution, abundance, and well-being of most plant and animal species is scanty. Inventories of the State's numerous aquatic and terrestrial environments and their inhabitants is an immense undertaking. The following is a preliminary list of a few endangered species in the Basin:

Endangered or Threatened Species		Plan Area
Mammals -	Pine marten	1
	Canada lynx	1
Birds -	Bald eagle	1, 3
	Osprey	1
	Cormorant	2
Reptiles -	Ornate box turtle	3
	Wood turtle	1, 2, 3
	Massasauga (rattlesnake)	2
Fish -	Greater redhorse	1, 3

Additions will be made to existing lists and Statewide protection will be expanded to include plants in the near future. To say that a species is endangered requires substantial supporting evidence. Likewise, to say that an endangered species does or does not occur in an area requires an onsite inventory of the area.

All species listed and discussed are known to occur in the Wisconsin River Basin, at least seasonally. The peregrine falcon is an example of a seasonal visitor. Scattered observations of peregrines are now made only during migration. Historical records show them as residents in the Lower Wisconsin River Basin.

Timber wolves were formerly distributed throughout the State, especially in forested wilderness areas. Presently, they are observed only in a few northern counties including Vilas, Oneida, Forest, and Price Counties. Even these are believed to be wanderers from Minnesota and Michigan.

RECREATIONAL RESOURCES

Overview of Recreational Resources

The Wisconsin River Basin is a region of great natural and manmade contrasts. These contrasts are apparent in the recreational opportunities offered in the three planning areas.

Plan Area 1 is characterized by an abundance of natural lakes, streams and forests which support a thriving tourist industry. The area contains more than 2,400 lakes covering more than 174,300 acres (70,500 ha) and about 1,900 miles (3,060 km) of rivers and streams. This surface water provides recreationists with some of the nation's finest fishing, boating, and swimming opportunities. Hundreds of thousands of acres of diverse forests including portions of the American Legion and Northern Highland State Forests and Chequamegon and Nicolet National Forests provide majestic scenery for the

Natural Lakes and Forest, Plan Area 1

sightseer, abundant game for the hunter, and a variety of recreational opportunities for all. The Wisconsin Department of Natural Resources classifies over 35 percent of the plan area's total acreage as recreational land. However, less than one-half of one percent of this area is developed. Among the developed lands are 14 county parks and one State park. Many provide lake or river access as well as opportunities for picnicking and hiking. Numerous recreational areas are also developed as part of the region's State and National forests.

Plan Area 2 is a region of geological contrast from the sand plains of Juneau and Adams Counties to the Coulee region of Monroe County where ridges tower hundreds of feet above valley floors. In contrast to Plan Area 1, there are few natural lakes in Plan Areas 2 and 3. The surface waters are instead dominated by the Wisconsin River, its tributaries and river flowages. Surface water reports published by the Wisconsin Department of Natural Resources identify over 86,000 acres (34,800 ha) of lakes in Plan Area 2. Over two-thirds of the acreage is accounted for by river flowages. Largest among these are Lake DuBay, Petenwell, and Castle Rock flowages on the Wisconsin River, and the Big Eau Pleine Reservoir on the Big Eau Pleine River. The 86,000-acre figure is misleading because of water level fluctuations and the presence of submerged tree stumps which often limit the use of such waters. An even more serious problem affecting the river flowages is water pollution. This problem affects the quality of the recreation. Programmed improvements in the quality of waste waters discharged by the paper industry and river communities should result in improvement in water quality which would, of course, enhance the region's resource base.

Plan Area 2 does not have significant State or National forests, although it does contain significant county forest land. In addition, the area contains the Necedah National Wildlife Refuge and the adjacent Central Wisconsin Conservation Area. Both are located in northwestern Juneau County. This plan area contains three State parks, the Elroy-Sparta State Trail, and 34 county parks. In total, about 10 percent of Plan Area 2 is classified as recreational land. This is about one-third of the portion found in Plan Area 1. The area contains more developed recreational land than Plan Area 1. About 1 1/2 percent of Plan Area 2's recreational land is developed.

With the exception of Columbia County and portions of Sauk County, Plan Area 3 lies in what is referred to as the "Driftless Area." High ridges and narrow valleys with steep wooded slopes characterize the region. Except for oxbows and meander scrolls in the flood plain of the Wisconsin River, the "Driftless Area" is devoid of natural lakes. About 18,000 acres (7,300 ha) of water are classified in the lake category. In Plan Area 3, as in Plan Area 2, most lake acreage is accounted for by impoundments of the region's rivers and streams. Lake Wisconsin, Plan Area 2's only impoundment of the Wisconsin River, is also the region's largest impoundment. Several small impoundments are scattered throughout the plan area. The largest of these is Lake Redstone located in Sauk County. This 600-acre (243 ha) impoundment is the project of a private developer. Several smaller impoundments in Iowa, Vernon, and Sauk Counties were constructed by the USDA as part of its small watershed flood protection program. Six of these are multipurpose in scope, providing recreation as well as flood control. Plan Area 3 contains over 31,000 stream-acres (12,500 ha). In contrast to Plan Areas 1 and 2, Plan Area 3 has only about 4 percent of its total area classified as recreational. Over 5 percent of this total is developed. Included among developed lands are 7 State and 10 county parks. Devils Lake State Park, located in Sauk County, is the State's most popular park. The most significant recreational attraction, however, is the Dells of the Wisconsin River. This is one of the Midwest's major recreational attractions.

Table A-7 Recreation Facilities
Wisconsin River Basin

Facility	Plan Area 1	Plan Area 2	Plan Area 3	Basin
Swimming				
- Areas	77	77	58	212
- Beach Frontage (L.Ft.)	22,847	18,674	14,005	55,526
- Beach Area (Sq.Ft	1,559,665	1,426,525	652,650	3,638,840
Boating				
- Areas	108	101	85	294
- Launch Sites	209	93	77	379
Picnicking				
- Areas	56	151	119	326
- Acres	250	906	668	1,824
- Tables	963	2,817	2,905	6,685
Camping				
- Areas	73	78	76	227
- Sites (Primitive/ Developed)	269/3054	186/3188	142/4910	597/11,152
Hiking Trails				
- Areas	14	56	31	101
- Trails (miles)	99	350	139	568
Horseback Riding				
- Areas	10	15	11	36
- Trails (miles)	68	67	57	192
Snowmobiling				
- Areas	16	24	8	48
- Trails (number)	26	38	14	78
- Trails (miles)	247	229	46	522
Motor Sports				
- Areas	4	7	3	14
- Trails (miles)	47	40	16	103
Bicycling - Trails (miles)	47	56	9	112
Nature Study				
- Areas	13	31	17	61
- Acres	214	942	653	1,809
Snow Skiing - Areas	6	12	6	24
Ice Skating - Areas	17	43	24	78
Target Sports				
- Areas	6	31	15	52
- Archery Ranges	0	21	4	25
- Rifle Ranges	4	13	5	22
- Pistol Ranges	3	5	2	10
Hunting				
- Areas	52	68	34	154
- Acres	701,590	325,439	56,804	1,083,833
Fishing				
- Areas	128	147	123	398
- Lakes	108	69	38	215
- Ponds	8	23	21	52
- Rivers and Streams	38	80	84	202

Source: Unpublished Inventory, Wisconsin Department of Natural Resources, 1970.

Recreational resources and facilities are summarized for each of the plan areas in table A-6. Wisconsin River Basin reference reports are available of recreational resources, recreational demand, and an analysis of hunting and fishing.

Historic Resources

While man has probably been on the North American Continent some 40,000 years, the earliest radio carbon dates associated with the Paleo Indians in the Wisconsin River Basin are between 9000 and 8000 B.C. These remains, a hearth and chipped stone debris, were found at the Raddatz Rockshelter in Sauk County, Plan Area 3. Prehistoric cultural remains are probably abundant in many counties of the Basin, but systematic and controlled excavations on private land have been limited until recent years. Laws of Wisconsin, 1965, Chapter 424, regulates the excavation and reporting of archeology finds. Archeological investigations on public lands and those private lands affected by the widening or relocation of old highways, construction of new highways, transmission lines, dams, bridges, buildings, dredge spoil disposal sites, and other land disturbing activities are mandatory, under Public Law 93-291, the Archeological and Historic Preservation Act of May 24, 1974. The Department of the Interior, National Park Service, and the Wisconsin State Historic Preservation Officer provide guidance to all Federal agencies within the State of Wisconsin.

Since 1673 when the French explorer Louis Joliet and his companion, Father Jacques Marquette, entered the Mississippi River from the Wisconsin River, this Basin has been enriched by a cultural heritage from other countries mixed with a new, vigorous, and evolving American style.

Many of the artifacts, residences, commercial and public buildings, mills, factories, and military establishments have been destroyed, but some have been preserved.

In order to identify, preserve, and protect these cultural resources, there are five public laws, procedures, an Executive Order and a National Register of Historic Places, which is periodically inserted in the Federal Register. As of December 1978, there were 373 Wisconsin sites listed in the National Register.

Sixty-five of these sites are in the Wisconsin River Basin - 5 in Plan Area 1, 12 in Plan Area 2, and 48 in Plan Area 3, table A-7.

Table A-8

Cultural Resource Sites
National Register of Historic Places
Wisconsin River Basin

Thematic Inventory	Plan Area 1	Plan Area 2	Plan Area 3
Prehistoric Culture	1	1	14
Performing Arts	-	-	1
Vernacular Architecture	-	2	4
19th Century Architecture	2	5	8
20th Century Architecture	-	2	4
Libraries	1	1	1
Exploration and Settlement	-	-	10
Commercial Enterprises	1	1	6
TOTAL	5	12	48

HUMAN AND ECONOMIC RESOURCES

APPENDIX B

APPENDIX B
HUMAN AND ECONOMICS RESOURCES

The Wisconsin River Basin has been physically described in appendix A. For economic analysis, the Basin has been delineated into three plan areas. These plan areas were selected so as to: (a) approximate the hydrologic area by county boundaries to allow utilization of published data; (b) encompass an area that is relatively homogeneous with respect to land use and agricultural practices; and (c) include an area with a minimum of three counties. This appendix describes the human and economic resources of the Basin and their development up to the present.

POPULATION AND POPULATION CHARACTERISTICS

The Wisconsin River Basin had an estimated population of 516,000 in 1975. This represents over 11 percent of the Wisconsin total population, table B-1. Population changed significantly between 1950 and 1975. Changes occurred in the rural-urban composition as well as in total population.

Between 1950 and 1975, the Basin's population grew at an average annual rate of 0.8 percent. In comparison, the State and National population growth rate during this period was 1.4 percent. Growth occurred primarily in Plan Areas 1 and 2 where population grew 28.4 and 29.2 percent, respectively, from 1950 to 1975. During this period, Plan Area 3 experienced an overall growth of 2 percent.

Net outmigration occurred in all plan areas between 1950 and 1960. In the following decade, 1960-1970, net outmigration continued in Plan Areas 2 and 3, but at a reduced rate. Plan Area 1 reported a net immigration during this period. Between 1970 and 1975, the trends in outmigration appeared to have declined as all plan areas experienced net immigration.

Significant changes in the rural-urban composition occurred between 1950 and 1970. In 1970, 38.0 percent of the population was classified as urban compared to 34.4 percent twenty years earlier. The rural-farm component declined during this period. In 1970, rural-farm residents comprised only 18 percent of the population while in 1950, they represented almost 36 percent of the population. This decline was absorbed by the rural non-farm component which increased from 29.7 percent of the total population in 1950 to 44.0 percent in 1970. More recent data on rural-urban composition are not available.

The population of the Basin tends to be slightly older than those of the State and Nation. The median age of Basin residents in 1970 was 28.9 years compared with 27.4 and 28.3 years for the State and Nation, respectively. Plan Area 3, with a median age of 33.5 years, had the oldest population in the Basin. Plan Area 2, with a median age of 27.0 years, had the youngest population.

The level of educational attainment of Basin residents is lower than both the State and National averages. Of the 1970 population 25 years and older, the

Table B-1

Population, 1950, 1960, 1970, and 1975
Wisconsin River Basin

	Population				Population Change			
	1950	1960	1970	1975 1/	1950-60	1960-70	1970-75	1950-75
					Percent			
Plan Area 1	52,246	53,782	58,884	67,100	2.9	9.5	14.0	28.4
Plan Area 2	223,909	241,240	269,659	289,200	7.7	11.8	7.2	29.2
Plan Area 3	156,556	152,216	155,401	159,900	-2.8	2.1	2.9	2.1
Basin	432,711	447,238	483,944	516,200	12.4	10.1	6.7	19.3
Wisconsin	3,434,575	3,951,777	4,417,731	4,606,000	15.1	11.8	4.3	24.1
U.S.	150,697,361	179,323,175	203,212,877	213,032,000	18.5	13.3		

Source: U.S. Census of Population, 1950, 1960, 1970.

1/ U.S. Department of Commerce, Bureau of Census, Series P-26, No. 74-49, September 1976

median number of school years completed was 11.6 compared to 12.1 years for both the State and Nation. Fifty percent of the Basin's residents 25 years and older have not completed high school and only 7.1 percent have completed 4 years of college.

Employment and Income

Employment increased from 160,200 in 1950 to 176,700 in 1970, a 10.3 percent expansion (table B-2). Unemployment increased from 3.6 percent in 1950 to 4.2 percent in 1970. Over the 20-year period, Basin unemployment has been consistently higher than the State level but lower than the National level.

In 1950, agriculture and forestry accounted for 34.5 percent of the employment. By 1970, this sector employed only 13.0 percent of the labor force. This decline was absorbed by the manufacturing, service, and wholesale-retail trade sectors which expanded their employment an average of 52.1 percent between 1950 and 1970. Manufacturing was the most prominent employer in 1970, employing almost one-fourth of the Basin's labor force. Data for 1975 1/ indicate that average agriculture and forestry employment dropped to 22,200 while nonagricultural employment increased to 170,000.

The Wisconsin River - Power For Industry, Plan Area 2

1/ Data from Wisconsin Department of Industry, Labor, and Human Relations.

Table B-2 Employment by Sectors, 1950, 1960, and 1970
Wisconsin River Basin

Sector	1950	1960	1970
	number		
Agriculture, Forestry	55,327	36,500	22,985
Manufacturing, all	30,866	37,819	44,022
Construction	7,345	7,886	11,011
Wholesale, Retail, Trade	24,063	26,298	33,558
Transportation, Communications, Public Utilities	9,201	8,651	10,336
Service	22,709	26,450	39,512
Finance	3,362	4,542	7,492
Mining	478	309	438
Public Administration	3,998	5,202	6,927
Armed Forces	159	213	401
Industry not reported	2,725	3,514	-
TOTAL	160,233	157,384	176,682

Source: U. S. Census of Population 1950, 1960, 1970: General, Social, and Economic Characteristics.

Industry Mix. Location quotients are indices used to describe the industry mix of a regional economy to a base economy. The location quotient in table B-3 compares the industry mix in the Basin to the U. S. economy from 1950 to 1970.

Of the industries listed in table B-3, significant specialization occurs only in agriculture, forestry, and fisheries. Between 1950 and 1970, the Basin has become more specialized in this industry relative to the Nation. Between 1950 and 1970, the location quotients for most industries have tended to approach one. This implies a general movement toward a more complex industrial economy with a higher degree of diversification.

Per Capita Income. The per capita income of Basin residents is significantly below both the State and National averages, table B-4. The Basin per capita income was 82.5 and 84.5 percent of the State level in 1969 and 1974. Similarly, in 1969 and 1974, Basin per capita income was 78.3 and 81.3 percent of the National level.

Table B-3 Location Quotients For Employment By Industry, 1950, 1960, and 1970 - Basin vs. United States
Wisconsin River Basin

Industry	1950	1960	1970
	----quotients 1/----------		
Agriculture, Forestry	2.83	3.46	3.51
Manufacturing, all	.75	.89	.96
Construction	.75	.85	1.03
Wholesale, Retail, Trade	.80	.92	.95
Transportation, Communications, Public Utilities	.73	.80	.88
Education	(NA)	1.00	.94
Services	1.01	.80	.96
Finance	.62	.69	.86
Mining	.19	.20	.25
Public Administration	.56	.66	.71

1/ A value equal to one indicates a particular industry's share of total employment is the same in the Basin as the U. S. It implies relative self-sufficiency in providing the goods and services of that industry. Values significantly greater than one indicates regional specialty and may imply Basin exports. Values less than one indicates an under representation and may imply a need to import some of the goods and services that particular industry provides.

Table B-4 Per Capita Income, 1969 and 1974
Wisconsin River Basin

	1969	1974
	----1975 dollars--	
Plan Area 1	4,344	6,853
Plan Area 2	4,739	7,381
Plan Area 3	4,796	6,990
Basin	4,710	7,193
Wisconsin	5,710	8,513
United States	6,018	8,860

Source: Survey of Current Business, U.S. Department of Commerce, Volume 57, Number 4, April 1977.

Recreation and Tourism

Recreation and tourism are important economic enterprises in the Wisconsin River Basin. In the northern portion, they are a source of income that provide jobs and support much of the economy.

Information from the Wisconsin Division of Tourism indicates that the total Basin expenditures by the public for recreation-tourism were over $612 million in 1976. Of this amount, Plan Area 1 expenditures were over $128 million; Plan Area 2 over $285 million; and Plan Area 3 almost $199 million.

Average expenditures per county in 1976 for recreation-tourism in Plan Area 1 was $42.8 million. This compared with 1976 average expenditures of $47.6 million in Plan Area 2, and $33.1 million in Plan Area 3. Table B-5 shows total 1976 expenditures for recreation-tourism.

Table B-5 Expenditures by the Public for Recreation-Tourism, 1976
Wisconsin River Basin

County	Expenditures
	(1000 Dollars)
Vilas	46,864
Oneida	55,308
Lincoln	26,176
Plan Area 1	128,348
Adams	14,340
Juneau	29,976
Marathon	70,085
Monroe	34,198
Portage	38,420
Wood	98,372
Plan Area 2	285,391
Columbia	53,619
Crawford	25,332
Iowa	18,576
Richland	13,424
Sauk	67,974
Vernon	19,843
Plan Area 3	198,768
BASIN	612,507

Source: "Wisconsin Travel Indicators", 1976, Wisconsin Division of Tourism.

TRANSPORTATION

The Wisconsin River Basin has approximately 23,800 miles (38,300 km) of public roads, which is 23 percent of the total State public road system. The 15 plan area counties in the Basin also occupy about 23 percent of the total area of the State.

About 11.8 percent of the roads in the Basin is State highway, 19.0 percent county highways, 68.0 percent town roads and city streets, and 1.2 percent park roads. There is an average of 1.9 miles of road per square mile (1.2 km) of Basin area. This figure varies from 1.5 miles per square mile (0.9 km) in Plan Area 2 to 2.0 miles per square mile (1.2 km) in Plan Areas 2 and 3. See table B-6 for further detail.

Approximately 1,120 miles (1,800 km) of railroads are within the Basin. About 46 miles (74 km) are used for AMTRAC passenger service.

Approximately 164 airports are located in the Basin, of which 23 are publicly owned. Eleven are private airports opened for public use, and the remaining 130 airports are for private use.

Table B-6

Miles of Road
Wisconsin River Basin

Plan Area	State	County	Local	Other	Total	Miles of road per square mile
1	462	615	3,171	150	4,398	1.5
2	1,126	2,191	7,589	75	10,981	2.0
3	1,211	1,722	5,439	61	8,433	2.0
TOTAL	2,799	4,528	16,199	286	23,812	Average 1.98

Source: Wisconsin Highway Mileage Data - 1976, Wisconsin Department of Transportation.

INSTITUTIONAL ARRANGEMENTS

Wisconsin has nine congressional districts with parts of the eighth, seventh, sixth, third, and second districts lying within the boundaries of the Wisconsin River Basin. The University of Wisconsin has a campus at Stevens Point and there are two-year extension centers at Baraboo, Richland Center, Marshfield, and Wausau. Portions of the Lac du Flambeau Indian Reservation are located in Vilas County.

There are three regional planning commissions within the Basin. Crawford and Vernon County are part of the Mississippi River Regional Planning Commission. In addition, Vernon and Crawford Counties nominate members to the interstate Mississippi River Parkway Planning Commission. Adams, Juneau,

Lincoln, Marathon, Oneida, Portage, Vilas, and Wood Counties are part of the North Central Wisconsin Regional Planning Commission. Iowa and Richland Counties are part of the Southwestern Wisconsin Regional Planning Commission.

In Portage County, there is the Portage County Areawide Planning Committee. Basinwide, there are special districts created to carry out functions which are local in nature. Many agencies, commissions, councils, and departments are involved in managing water and land-related resources. The Sierra Club, the Audubon Society, Trout Unlimited, and many other nongovernmental public institutions concerned with water resources function in the Basin.

AGRICULTURAL PRODUCTION AND INCOME

The 1974 Census of Agriculture indicates that the value of agricultural product sales for all farms totaled $481 million in 1974. This represents a 62 percent increase over the 1969 level and a 111 percent increase over the 1964 level, table B-7. Most of this differential in value of sales can be attributed to changes in agricultural product prices. In 1974, Plan Area 3 generated 54 percent of the Basin's agricultural sales; Plan Area 1 accounted for less than 4 percent of sales.

Between 1964 and 1974, crop sales in the Basin increased from $43 million to $107 million. In 1974, crop sales were responsible for 22 percent of all agricultural sales. Plan Area 3 generated one-half of the crop sales in that year.

Livestock, poultry, and poultry product sales totaled $371 million in 1974. This represents 77 percent of all agricultural product sales. One-fifth of the Wisconsin livestock and poultry sales originated in the Basin in 1974. Livestock and poultry production is emphasized most heavily in Plan Area 3 where these sales were 80 percent of all agricultural product sales in 1974. Plan Area 3 produced 55 percent of the livestock and poultry product sales. In 1974, less than 3 percent of such sales originated in Plan Area 1.

Crop Production. Hay is the single largest crop produced. In 1974, 38 percent of the cropland was devoted to the production of hay crops, tables B-8 and B-9. Nearly 23 percent of the Wisconsin hay acreage was located in the Basin in 1974.

One fourth of the Basin cropland was utilized for corn production in 1974. Almost 70 percent of this acreage was used for the production of grain with the remainder harvested for silage. Increases in yields and harvested acreages from 1964 to 1974 resulted in a 71 percent rise in grain production. The Basin accounted for 19 percent of the Wisconsin corn acreage in 1974. Basinwide, small grain production has been decreasing in importance. Soybean production, although increasing, is relatively insignificant when compared with corn.

Cropland pasture is becoming increasingly important, particularly in Plan Area 3. Vegetable acreage increased 28 percent from 1964 to 1974, most of which was located in Plan Area 2.

Table B-7

Sales of Agricultural Products, 1964, 1969, and 1974 [1/]
Wisconsin River Basin

	Plan Area 1			Plan Area 2			Plan Area 3			Basin		
	1964	1969	1974	1964	1969	1974	1964	1969	1974	1964	1969	1974
	1000 dollars											
Crops	3,218	2,965	6,067	23,986	23,420	49,240	15,490	18,586	52,005	42,694	44,971	107,312
Livestock & products	6,118	8,110	10,331	77,139	99,983	154,354	99,782	143,561	206,696	183,039	251,654	371,381
Forest products	220	128	248	1,165	576	1,434	1,650	452	963	3,035	1,156	2,645
Total Ag product	9,556	11,203	16,646	102,290	123,979	205,028	116,922	162,599	259,664	228,768	297,781	481,338

1/ U.S. Census of Agriculture, 1964, 1969, 1974.

Table B-8 Crop Acreage, 1964, 1969, and 1974 [1/]
Wisconsin River Basin

	1964	1969	1974
	acres		
Corn grain	289,651	315,245	450,319
Corn silage	176,410	137,221	196,838
Hay	880,034	755,406	928,350
Wheat	3,659	2,535	6,294
Other small grains [2/]	373,977	304,768	258,200
Soybeans	14,834	11,254	17,217
Vegetables	47,004	54,663	60,350
Potatoes	24,459	23,071	23,548
Fruits	2,109	1,941	2,597
Tobacco	6,172	3,492	4,651
Other crops	3,251	18,364	16,134
Total harvested cropland	1,821,560	1,627,960	1,964,498
Cropland pasture	383,313	426,947	434,723
Other cropland	270,357	283,093	134,555
Total cropland	2,430,230	2,338,000	2,533,776

1/ U.S. Census of Agriculture, 1964, 1969, 1974.

2/ Includes oats, barley and rye.

Table B-9 Crop Production, 1964, 1969, and 1974 [1/]
Wisconsin River Basin

	1964	1969	1974
	1000 units		
Corn grain (bu)	19,799.7	27,078.2	33,339.3
Corn silage (ton)	1,712.0	1,492.7	1,963.0
Hay (ton)	1,912.8	2,015.0	2,217.7
Oats (bu)	[2/]	[2/]	[3/] 13,486.3
Wheat (bu)	118.6	91.7	244.5
Barley (bu)	[2/]	[2/]	[3/] 67.6
Rye (bu)	[2/]	[2/]	[3/] 61.6
Soybeans (bu)	206.9	212.3	382.5
Vegetables (cwt)	[2/]	[2/]	[3/] 3,865.9
Potatoes (cwt)	[2/]	[2/]	8,020.3
Fruits (ton)	[2/]	[2/]	[3/] 33.4
Tobacco (lb)	9,786.3	6,190.5	8,459.5

1/ U.S. Census of Agriculture, 1964, 1969, 1974.

2/ Data not reported in census.

3/ Average of 1973, 1974, 1975 data from "Wisconsin Agricultural Statistics".

Harvesting Cranberries, Plan Area 2

Livestock Production. The sale of dairy products is the single largest source of farm income for Basin farmers. For commercial farms, dairy product sales represented 65 percent of all livestock and poultry sales and 54 percent of all agricultural product sales in 1974. In this same year, dairy product sales for commercial farms exceeded $250 million. The Basin generates approximately one-fifth of the Wisconsin dairy product sales, tables B-10 and B-11.

Cattle and calf sales accounted for 20 percent of the Basin's livestock and poultry sales in 1974. Plan Area 3 produced 65 percent of the cattle and calf sales in 1974. Although Basin sales have been increasing, actual production has been declining since 1964, table B-11.

Plan Area 3 produced three-fourths of the hogs and pigs marketed in 1974. The Basin hog and pig sales represented one-fifth of the State sales in this year. Basin farmers produced one-fourth of the Wisconsin sheep and lamb sales in 1974. Despite this large share of the State's production, sheep and lamb sales have declined 51 percent from 1964 to 1974.

Table B-10

Livestock, Poultry, and Product Sales, 1969 and 1974 - Commercial Farms
Wisconsin River Basin

	Poultry and poultry products		Dairy products		Cattle and calves		Other livestock and livestock products		Total livestock, poultry, and products sold	
	1969	1974	1969	1974	1969	1974	1969	1974	1969	1974
	----------	----------	----------	----------	---------- 1000 dollars ----------		----------	----------	----------	----------
Plan Area 1	307	266	5,109	7,461	1,300	1,426	1,147	969	7,959	10,190
Plan Area 2	3,178	3,963	71,942	120,672	18,206	22,459	1,737	6,258	98,689	153,313
Plan Area 3	3,582	5,560	77,836	125,089	39,120	46,087	1,430	24,003	141,695	200,759
Basin	7,067	9,789	154,887	253,222	58,626	69,972	4,314	31,260	248,343	364,262
Wisconsin	55,198	86,534	782,603	1,261,108	261,136	324,790	20,550	179,277	1,239,568	1,851,710

Source: U.S. Census of Agriculture, 1969, 1974.

Table B-11

Livestock and Poultry Sold, 1964, 1969, and 1974
Wisconsin River Basin

	Plan Area 1			Plan Area 2			Plan Area 3			Basin		
	1964	1969	1974	1964	1969	1974	1964	1969	1974	1964	1969	1974
	number											
Cattle & calves	14,489	12,769	10,379	185,071	159,210	141,299	239,417	236,024	199,279	438,977	408,003	350,957
Hogs & pigs	5,980	4,614	4,970	162,506	127,159	108,722	500,967	463,461	345,707	669,453	595,234	459,399
Sheep & lambs	681	306	198	7,668	3,878	2,898	30,355	26,468	15,755	38,704	30,652	18,851
Hens & pullets	26,071	10,573	20	242,812	368,343	86,754	552,511	708,542	338,772	821,394	1,087,458	425,546
Broilers	0	0	135	571,960	258,386	7,953	0	122,552	34,983	571,960	380,938	43,071
Turkeys	209	0	0	990,665	397,180	576,660	326,422	90,771	205,926	1,317,296	487,951	782,586

Source: U.S. Census of Agriculture, 1964, 1969, 1974.

FOREST PRODUCTION AND INCOME

Forest Production

Timber removals[1/] in 1973 were 64,787,000 cubic feet (1,834,600 cu m). This is 2.5 percent of the 2,642,900,000 cubic feet (74,839,000 cu m) of growing stock 2/. Sixteen percent of the removals were softwoods while 84 percent were hardwoods.

Growing stock is 24 percent of the State total while timber removals are 30 percent of the State total; an indicator of the importance of the Basin's forest industry to Wisconsin's economy. Table B-12 shows the county breakdown of timber removals.

The approximate value of the logs delivered to processing mills for wood and lumber products in 1972 totaled $109.2 million. Value added by the mills was $87.8 million, for a total value to the economy of $197.5 million. 3/

Forest Employment

Employment in the 168 establishments and operations is 5,900 with an annual payroll of $44.4 million in 1972. Logging operations, sawmills, and veneer mills are the main industries represented. There are 10 pulpmills located in the Basin.

Prime Forest Land

Prime forest land has soils capable of growing wood at an average annual rate of 85 cubic feet or more per acre (5.9 cu m/ha) under a system of management that maintains soil productivity and protects water quality. Table B-13 is a summation of forest lands meeting these criteria.

1/ Timber removal is the volume of round wood in live sawtimber and pole timber trees removed annually for forest products.
2/ Growing stock includes all live trees of any size except rough and rotten trees.
3/ Source: U. S. Department of Commerce, Bureau of Census.

Table B-12

Timber Removals, 1973
Wisconsin River Basin

County	Softwood	Hardwood	Total
	1,000 cubic feet		
Vilas	1,627	7,155	8,782
Oneida	2,679	12,333	15,012
Lincoln	1,464	8,718	10,182
Plan Area 1	5,770	28,206	33,976
Marathon	378	8,638	9,012
Wood	737	3,301	4,038
Portage	517	1,592	2,109
Monroe	147	981	1,128
Juneau	1,180	2,346	3,526
Plan Area 2	4,475	18,630	23,105
Columbia	104	631	735
Sauk	123	1,868	1,991
Iowa	-	396	396
Richland	23	1,284	1,307
Vernon	-	2,272	2,272
Crawford	-	1,005	1,005
Plan Area 3	250	7,456	7,706
BASIN	10,495	54,292	64,787

Source: Resource Bulletin NC-31, 1976, North Central Forest Experiment Station, USDA, Forest Service.

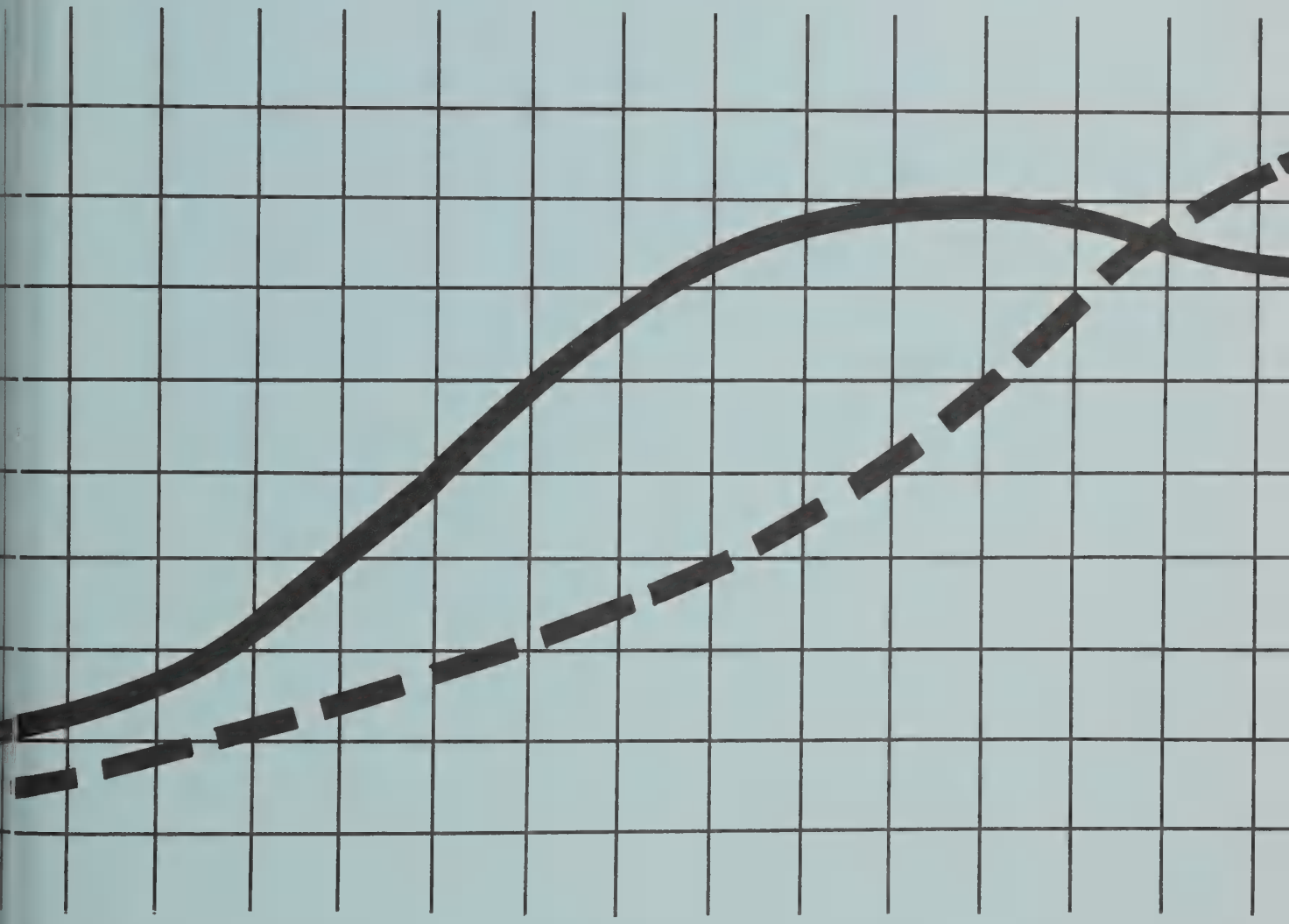
Timber Production - A Major Enterprise in Plan Area 1

Table B-13 Prime Forest Land Acreage, 1968
Wisconsin River Basin

	Production Levels - Cubic Feet			
	85-120	120-165	165-225	Total
	----------Acres----------			
Vilas	498	79	4	581
Oneida	718	107	1	826
Lincoln	498	74	3	575
Plan Area 1	1,714	260	8	1,982
Marathon	248	53	11	312
Wood	143	31	6	180
Portage	106	23	5	134
Juneau	159	34	7	200
Adams	166	36	7	209
Monroe	145	31	6	182
Plan Area 2	967	208	42	1,217
Columbia	57	1	1	59
Richland	72	2	2	76
Sauk	106	3	3	112
Vernon	97	2	2	101
Crawford	91	2	2	95
Iowa	84	2	2	88
Plan Area 3	507	12	12	531
BASIN	3,188	480	62	3,730

Source: Resource Bulletin, NC-15, 1972, North Central Forest Experiment Station, USDA, Forest Service

PROJECTIONS



APPENDIX C

APPENDIX C - PROJECTIONS

This appendix presents the methodology, assumptions, and projections utilized as a basis for estimating the general situation expected to occur in the projection years in the Wisconsin River Basin. This is the framework within which the future-without and alternative analyses were conducted.

METHODOLOGY

The projection of economic and demographic activity and implied land use within a region is more useful when analyzed in the context of National trends. Therefore, the first step is the projection of National economic and demographic activity and benchmark requirements for food, feed, and fiber. From these National benchmarks, allocation can then be made to regional levels based upon historical shares and projected production trends. These projections of regional activity are prepared by OBERS, Bureau of Economic Analysis (formerly OBE) and the Economics, Statistics, and Cooperatives Service (formerly ERS).

The OBERS series E projections [1/] are based on general assumptions which represent conditions believed to have the greatest probability of occurrence over a long time period. The projections, therefore, represent estimates that would result if all assumed conditions materialize. These assumptions are:

1. Growth of population will be conditioned by a decline of fertility rates from those of the 1962-65 period.

2. Nationally, there will be reasonably full employment, represented by a 4 percent unemployment rate.

3. There will be no foreign conflicts.

4. Continued technological progress and capital accumulation will support a growth in private output per man-hour of 3 percent annually.

5. The new products that appear will be accommodated within the existing industrial classification system.

6. Growth in output can be achieved without ecological disaster or serious deterioration.

1/ This section summarizes the conceptual framework methodology as described in 1972 OBERS Projections of Regional Activity in the U. S. (Series E Population). Volume 1. Concepts, Methodology, and Summary Data, U. S. Water Resources Council, 1974. The reader should refer to this source if greater detail is desired.

The regional projections are based on the following additional assumptions:

1. Most factors that have influenced historical shifts in the location of regional "export" industries will continue into the future.

2. Trends toward economic area self-sufficiency in local-service industries will continue.

3. Workers will migrate to areas of economic opportunities.

4. Regional earnings per worker and income per capita will continue to converge toward the National average.

5. Regional employment/population ratios will tend to move toward the National ratio.

The estimates made, using these assumptions, represent baseline projections in that they are the best estimates of what may materialize should there be no major unforeseen changes in the significant factors. In essence, these baseline projections serve as a point of reference for evaluative purposes.

Projections of population, employment, and income were available from OBERS[1/] because the Wisconsin River Basin corresponds to one of the OBERS subareas. These projections were found to be consistent with trends in other data so no adjustments were made. The series E growth rate was applied to the 1970 population for each plan area to get projections by plan area. These plan area growths were constrained to the projected Basin total.

POPULATION

Population within the Basin is projected to increase 14.9 percent by the year 2000. These projections are based upon the OBERS series E and are shown in table C-1. The table also contains comparison projections of the series C and an estimate based upon a 20-year historical trend. Plan Area 2 is projected to have the greatest expansion between 1970 and 2000, 19.6 percent, and Plan Area 3 the least, 7.4 percent. The 1975 estimates indicate that Plan Area 1 may have already surpassed its projected 2000 population. This would probably indicate a major difference in migration compared to the series E assumtpion, which does not account for regional migration. Plan Area 2 is projected to have a 11.5 percent increase between the 1975 estimate and 2000, and Plan Area 3, a 4.3 percent increase.

1/ 1972 OBERS Projections of Regional Activity in the U.S.(eries E Population). Volume 3, Water Resources Regions and Subareas, U.S. Water Council, 1974.

Table C-1 Population, 1970, 1975, and Projections to 2000
Wisconsin River Basin

	1970[1]	1975[2]		2000
Plan Area 1	58,884	67,100	Series E[3]	66,700
			Series C[4]	80,300
			Historical Trend[5]	77,300
Plan Area 2	269,659	289,200	Series E	332,500
			Series C	387,900
			Historical Trend	376,600
Plan Area 3	155,401	159,900	Series E	166,800
			Series C	200,600
			Historical Trend	167,700
Basin	483,944	516,200	Series E	566,000
			Series C	668,800
			Historical Trend	621,600
Wisconsin	4,417,731	4,606,000	Series E	5,233,900
			Series C	6,390,000
U.S.	203,857,864	213,032,000	Series E	263,830,000
			Series C	306,782,000

1/ City-County Data Book.

2/ Estimates. U.S. Department of Commerce, Bureau of Census, Series P-26, No. 74-49, September 1976.

3/ OBERS baseline projection corresponds to growth rate of 0.9 percent per year, series E.

4/ Former OBERS projected growth rate of 1.3 percent per year, series C.

5/ Projection based upon compound annual growth rate calculated for each plan area between 1950 and 1970.

EMPLOYMENT AND INCOME

Total Basin employment figures based on series E are projected to increase from 171,868 in 1970 to 240,800 in 2000. Per capita income, in 1975 dollars, is projected to increase from 4,504 in 1970 to 11,400 in 2000. Table C-2 shows that this income increase will reduce the gap between the Basin per capita income and the State and National average.

Table C-2 Employment and Income, 1970 and 2000
Wisconsin River Basin

	1970	2000
Total Employment		
Basin	171,868	240,800
Wisconsin	1,730,215	2,364,900
U.S.	79,306,527	117,891,000
Per Capita Income	(1975 dollars)	
Basin	4,504	11,400
Wisconsin	5,332	12,700
U.S.	5,603	13,100
Per Capita Income Index		
Basin	.80	.87
Wisconsin	.95	.97
U.S.	1.00	1.00

Source: 1972 OBERS Series E

LAND USE

The major land use categories and their projected changes are presented in table C-3. Cropland and forest land are projected to show a consistent decline over time except for cropland in Plan Area 2 in 2000. This slight increase comes at the expense of some cleared forest and some drained pastureland. Urban acreages are projected to increase proportionally to urban population growth except for Plan Area 1 which has a decreasing urban population trend. The resulting projection for Plan Area 1 was no change in urban acreage. The category of other land is expected to increase in all plan areas while pastureland is expected to decrease slightly in Plan Areas 2 and 3 to remain constant in Plan Area 1.

The land use projections were derived through a multiphased process. The expansion of urban land corresponds to the rate of population growth. Cropland, pastureland, and forest land were based upon trends depicted from past census figures, State and local estimates, an updated CNI survey, and

Table C-3

Land Use, Current and 2000
Wisconsin River Basin

	Plan Area 1		Plan Area 2		Plan Area 3		Basin	
	Current	2000	Current	2000	Current	2000	Current	2000
	1000 Acres							
Cropland	91.1	89.3	1,087.6	1,109.4	1,300.6	1,287.5	2,479.3	2,486.2
Pasture	80.8	80.8	465.4	448.9	474.2	473.7	1,020.4	1,003.4
Forest 1/	1,399.9	1,349.5	1,455.4	1,403.0	723.2	697.1	3,578.4	3,449.6
Other 2/	153.4	205.7	243.9	281.1	135.0	171.6	532.3	658.4
Urban	87.6	87.6	161.6	171.5	123.8	126.8	373.0	385.9
Water and non-Inventoried 3/		202.6		196.6		69.4		468.6
Total Surface Area		2,015.4		3,610.5		2,826.2		8,452.1

1/ Includes National Forest acreage.

2/ Includes farmsteads, feedlots, investment tracts, strip mines, borrow and gravel pits, etc.

3/ Includes all water areas and federally owned land except forest.

other data sources. The category of other land is used as the residual to maintain a constant surface area. The 1977 acreages were derived from the Soil Conservation Service resurvey of the 1967 CNI sample plots and an expansion of that sample.

AGRICULTURE

The projections for livestock and most crops come directly from the 1972 OBERS E' National projections as described at the beginning of this appendix. Tables C-4 and C-5 present these figures and, for comparison purposes, the current figures, which are the average of the 1973, 1974, and 1975 reported figures. The projections of corn silage, hay, and pasture are based upon the livestock projections using normal feed rations and compositions. This method gives the roughage projections high reliability by being tied to the livestock projections.

The projections indicate continued increases in the production of corn, oats, corn silage, soybeans, vegetables, potatoes, pork, turkeys, and milk. Substantial decreases are projected for production of wheat, barley, rye, tobacco, beef and veal, chickens, and eggs.

Table C-4 Crop Production, Current and 2000
Wisconsin River Basin

	Unit	Current[1]	2000[2]
		----------1000 units----------	
Corn	(bu)	33,480.6	53,279.5
Oats	(bu)	13,597.5	24,360.1
Corn Silage [3]	(ton)	1,922.4	2,247.4
Hay [3]	(Ton)	2,310.1	1,414.2
Pasture [4]	(Ton)	2,517.9	2,003.0
Wheat	(bu)	191.2	58.3
Barley	(bu)	67.6	6.5
Rye	(bu)	61.6	18.5
Soybeans	(bu)	450.4	1,128.2
Vegetables	(cwt)	3,865.9	4,561.2
Potatoes	(cwt)	6,796.6	8,697.4
Fruits	(Ton)	33.4	31.5
Tobacco	(lbs)	10,152.7	4,369.2

[1] Figures are 1973, 1974, and 1975 average from Wisconsin Statistical Reporting Service publications entitled, "Wisconsin Agricultural Statistics".

[2] Projections are 1972 OBERS E' except for silage, hay, and pasture.

[3] Production for 2000 based on roughage required for livestock.

[4] Calculation same as [3]. This includes both cropland pasture and permanent pasture.

Yields are projected to increase from 48 to 73 percent by 2000 over 1960 levels, table C-6. Roughages show the greatest increases, from 67 percent for corn silage to 96 percent for hay. The yield projections were derived from published projections by soils and are nearly identical to the rates of increase projected by OBERS. The projections reflect the assumption of continued research and technological advances but at a lesser rate than in the past, plus improvements in varieties and management practices and more efficient use of pesticides and fertilizers.

Projections of water requirements are shown in table C-7. These indicate that by 2000 there will be slight increases in irrigation and rural domestic requirements, partially offset by a decrease in livestock needs. State estimates were utilized to project irrigated acres, table C-8, and specified irrigation rates 1/ were applied to these acres. The rural population was derived from the total population projections and animal units were derived from table C-5. Water use rates 2/ were then applied to these figures. A recent survey 3/ indicates that total irrigation acreage has increased at a greater rate (104,000 acres [42,100 ha] in 1977). This already exceeds the 2000 projections of table C-8. Water quality may become a problem but quantity is projected to be sufficient.

RECREATION

Recreational demands for summer and other activities are summarized by plan area in tables C-9 through C-12. All demand figures are expressed in recreational occasions and are reported for 1970 and projected for the years 2000. Demands for summer activities are reported for State residents and nonresidents, while other activities are reported for State residents only. These figures do not account for latent demand (demands which would be expressed if adequate facilities were available).

1/ University of Wisconsin, Department of Horticulture and Great Lakes Irrigation Appendix No. 15 were the source of the irrigation rates.

2/ Great Lakes Basin Basic Water Use Budgets 2000 and 2020, adapted from Water Systems Analysis to Meet Changing Conditions, Agricultural Engineering Information Series 152, 1965, Michigan State University; Farm Water Systems Planning Guide, Agricultural Engineering Information Series 181, 1967, Michigan State University; Private Water Systems, Midwest Plan Service-14, Iowa State University, 1968; and Dairy Farmstead Water Use, paper by Elmer E. Jones, USDA-ARS, Beltsville, Md., June, 1964.

3/ 1977 Irrigation Data Survey, Soil Conservation Service and University of Wisconsin-Extension.

Table C-5 Livestock Production, Current and 2000
Wisconsin River Basin

		Current [1]	2000 [2]
		1000 units	
Beef & Veal	(lbs)	217,338.0	177,571.8
Pork	(lbs)	98,016.0	138,033.9
Lamb & Mutton	(lbs)	1,709.0	513.3
Chickens	(lbs)	3,367.0	1,353.5
Broilers	(lbs)	3,407.0	7,097.7
Turkeys	(lbs)	20,592.0	43,970.7
Eggs	(dozens)	18,220.5	7,941.7
Milk	(lbs)	3,836,700.0	3,933,500.0

[1] Figures are 1973, 1974, and 1975 average from Wisconsin Statistical Reporting Service publications entitled, "Wisconsin Agricultural Statistics".

[2] Projections from 1972 OBERS E'.

Table C-6 Yield Indexes, 1970 and 2000
Wisconsin River Basin

Crop	1970	2000
	Index Number	
	1960 = 100	
Corn	112	148
Oats	113	148
Corn Silage	115	152
Hay	123	173
Crop Pasture	120	167
Perm Pasture	120	155

Table C-7

Water Requirements, 2000
Wisconsin River Basin

	Livestock	Rural Domestic	Irrigation	Total
	----------Million gallons----------			
Plan Area				
1	603.6	1,307.9	11,264.5	3,076.0
2	8,905.7	4,566.7	12,377.5	25,849.9
3	10,880.0	3,179.3	2,577.8	16,637.1
Basin	20,389.3	9,053.9	26,219.8	45,563.0

Table C-8

Irrigated Acres, Current and 2000
Wisconsin River Basin

	Current 1/	2000
	----------Acres--------	
Potatoes		
Plan Area 1	1,492	3,400
2	14,651	26,000
3	47	200
Basin	16,190	29,600
Fruit		
Plan Area 1	315	300
2	1,592	1,700
3	238	500
Basin	2,145	2,500
Other Vegetables		
Plan Area 1	0	0
2	14,514	21,100
3	4,000	14,100
Basin	18,514	35,200

1/ Current is 1973, 1974, and 1975 average, Wisconsin Agricultural Statistics.

Table C-9

Summer Recreation Participation
Plan Area 1, 1970 and 2000
Wisconsin River Basin

Activity	1970 [1] Resident	1970 [1] Non-resident	1970 [1] Total	2000 [2] Resident	2000 [2] Non-resident	2000 [2] Total
	Occasions					
Swimming	25,460	49,840	75,300	28,840	56,470	85,320
Picnicking	8,670	6,760	15,430	9,830	7,660	17,480
Camping	9,270	12,020	21,290	10,500	13,610	24,120
Golfing	1,560	1,880	3,440	1,760	2,140	3,900
Canoeing	2,670	8,360	11,030	3,020	9,470	12,500
Fishing	20,040	35,170	55,210	22,700	39,850	62,550
Water-skiing	5,900	9,420	15,320	6,680	10,680	17,360
Nature Study	180	7,850	8,040	210	8,900	9,110
Motor Boating	14,630	22,170	36,800	16,570	25,120	41,690
Hiking over 4 hrs.	450	410	860	510	460	970
Hiking under 4 hrs.	6,390	12,900	19,290	7,240	14,620	21,860
Bicycling	0	870	870	0	0	980
Sightseeing	6,720	15,250	21,970	7,610	17,280	24,890
Horseback riding	540	-	-	610	-	-
Snow-skiing	1,470	-	-	1,670	-	-
Snowmobiling	6,640	-	-	7,530	-	-
Bow Target	1,520	-	-	1,730	-	-
Gun Target Shooting	1,830	-	-	2,080	-	-
Trapshooting	320	-	-	360	-	-
Hunting	212,380	-	-	240,630	-	-

1/ Wisconsin Department of Natural Resources

2/ Based upon projected populations

Table C-10

Summer Recreation Participation
Plan Area 2, 1970 and 2000
Wisconsin River Basin

Activity	1970[1] Resident	1970[1] Non-resident	1970[1] Total	2000[2] Resident	2000[2] Non-resident	2000[2] Total
	Occasions			Occasions		
Swimming	16,290	6,170	22,460	19,480	7,380	26,860
Picnicking	14,340	3,550	17,900	17,160	4,250	21,410
Camping	1,640	4,920	6,560	1,960	5,880	7,840
Golfing	1,690	310	2,000	2,020	380	2,390
Canoeing	60	420	480	80	500	570
Fishing	3,080	3,010	6,100	3,690	3,600	7,290
Water-skiing	1,570	870	2,440	1,880	1,040	2,920
Nature Study	230	1,320	1,560	280	1,580	1,860
Motor Boating	1,200	2,120	3,320	1,440	2,530	3,970
Hiking over 4 hrs.	0	40	40	0	40	40
Hiking under 4 hrs.	2,040	2,200	4,250	2,440	2,640	5,080
Bicycling	240	780	1,010	280	930	1,210
Sightseeing	6,770	1,700	8,470	8,100	2,030	10,130
Horseback Riding	2,680	-	-	3,210	-	-
Snow-skiing	3,950	-	-	4,730	-	-
Snowmobiling	13,550	-	-	15,210	-	-
Bow Target Shooting	4,690	-	-	5,600	-	-
Gun Target Shooting	4,230	-	-	5,060	-	-
Trapshooting	470	-	-	560	-	-
Hunting	814,560	-	-	974,210	-	-

1/ Wisconsin Department of Natural Resources

2/ Based upon projected populations.

Table C-11

Summer Recreation Participation
Plan Area 3, 1970 and 2000
Wisconsin River Basin

Activity	1970 [1] Resident	1970 [1] Non-resident	1970 [1] Total	2000 [2] Resident	2000 [2] Non-resident	2000 [2] Total
	Occasions			Occasions		
Swimming	26,520	27,040	53,560	28,490	29,040	57,520
Picnicking	20,890	13,420	34,310	22,440	14,410	36,850
Camping	11,680	21,200	32,880	12,540	22,770	35,320
Golfing	1,800	1,040	2,840	1,930	1,120	3,050
Canoeing	3,110	2,250	5,360	3,340	2,410	5,760
Fishing	7,840	9,160	17,000	8,420	9,840	18,260
Water-skiing	2,710	1,430	4,140	2,910	1,540	4,450
Nature Study	430	6,780	7,210	460	7,280	7,740
Motor Boating	6,880	8,110	14,990	7,390	8,710	16,100
Hiking over 4 hrs.	480	980	1,460	520	1,050	1,570
Hiking under 4 hrs.	7,050	13,400	20,450	7,570	14,390	21,970
Bicycling	220	1,550	1,770	230	1,670	1,900
Sightseeing	10,860	20,100	30,960	11,660	21,590	33,250
Horseback Riding	2,330	-	-	2,500	-	-
Snow-skiing	1,030	-	-	1,100	-	-
Snowmobiling	3,490	-	-	3,746	-	-
Bow Target Shooting	1,770	-	-	1,900	-	-
Gun Target Shooting	2,420	-	-	2,600	-	-
Trapshooting	700	-	-	750	-	-
Hunting	450,667	-	-	480,020	-	-

1/ Wisconsin Department of Natural Resources

2/ Based upon projected populations

Demands for recreational activities are expected to increase by 14 percent by the year 2000. Future demands by individual plan areas are dependent upon future population projections as follows: Plan Area 1, 13 percent by 2000; Plan Area 2, 20 percent by 2000; and Plan Area 3, 11 percent by 2000.

FORESTRY

Forestry will be affected by several factors in the next 20 years. The land base for forestry is expected to decrease while timber yields are expected to increase. The decrease in land base can be attributed to urban expansion, rights-of-way for roads and utilities, and agricultural clearing. Increases in timber yield can be attributed to maturing forests, increased utilization, and a more intensive system of growing trees.

Commercial forest land is expected to decrease approximately 4 percent by 2000 with the forest base decreasing from about 3,578,400 acres (1,448,000 ha) in 1970 to about 2,449,600 acres (991,400 ha) in 2000.

Annual timber yields are expected to increase from 64,300,000 cubic feet (1,821,000 cu m) in 1970 to 131,200,000 cubic feet (3,715,000 cu m) in 2000. Table C-12 summarizes removals, OBERS demands, and net annual growth.

Forest Land grazing will continue in the future. Grazing on Forest land totaled 662,700 acres (268,200 ha) in 1970. This acreage is expected to decrease to 638,700 acres (258,500 ha) in 2000.

Table C-12 Timber Removals, Obers Demands, and Net Annual Growth
Wisconsin River Basin

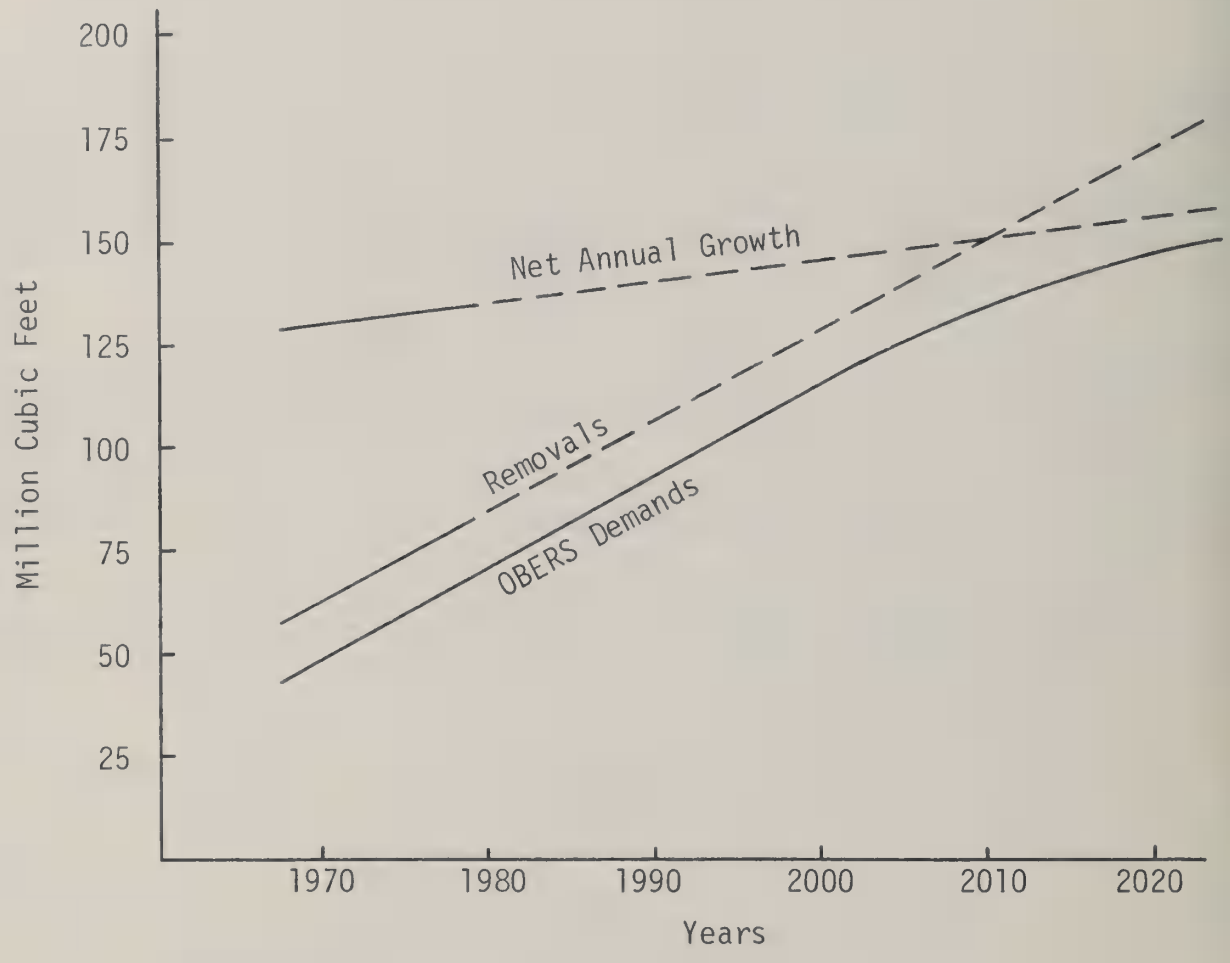
Year	Removals 1/	OBERS Demands 2/	Net and Annual Growth 1/
	----------1,000,000 Cubic Feet----------		
1970	64.3	49.0	131.7*
2000	131.2	115.4	143.6**

* 1968 figure
** 1998 figure

1/ North Central Forest Experiment Station Projections

2/ OBERS Series E Projections

Timber Removals, OBERS, Demand and Net Annual Growth
Wisconsin River Basin



FLOODPLAIN MANAGEMENT

APPENDIX D

APPENDIX D
FLOOD PLAIN MANAGEMENT

Currently, average annual floodwater damages in the Wisconsin River Basin are estimated at $3,511,000 in chapter 3. This appendix discusses some means of modifying the impact of and the susceptibility to damages from floodwater, sediment, or erosion.

FLOOD PREVENTION

Flood prevention is defined as any undertaking which reduces hazard from floodwater, sediment, or erosion. To differentiate flood prevention from drainage on flatlands, flood prevention is considered as any undertaking that reduces or prevents damages from surface water caused by abnormally high direct precipitation or stream overflow.

Project measures for flood prevention consist of land treatment measures, structural measures, or nonstructural measures that provide flood prevention benefits to groups of landowners, to communities, or to the general public. A flood plain management program or system is often composed of a combination of land treatment, nonstructural, and structural measures. See exhibit D-1. Flood plain management programs ordinarily require community or group action for their implementation. They should be planned on a watershed-wide basis.

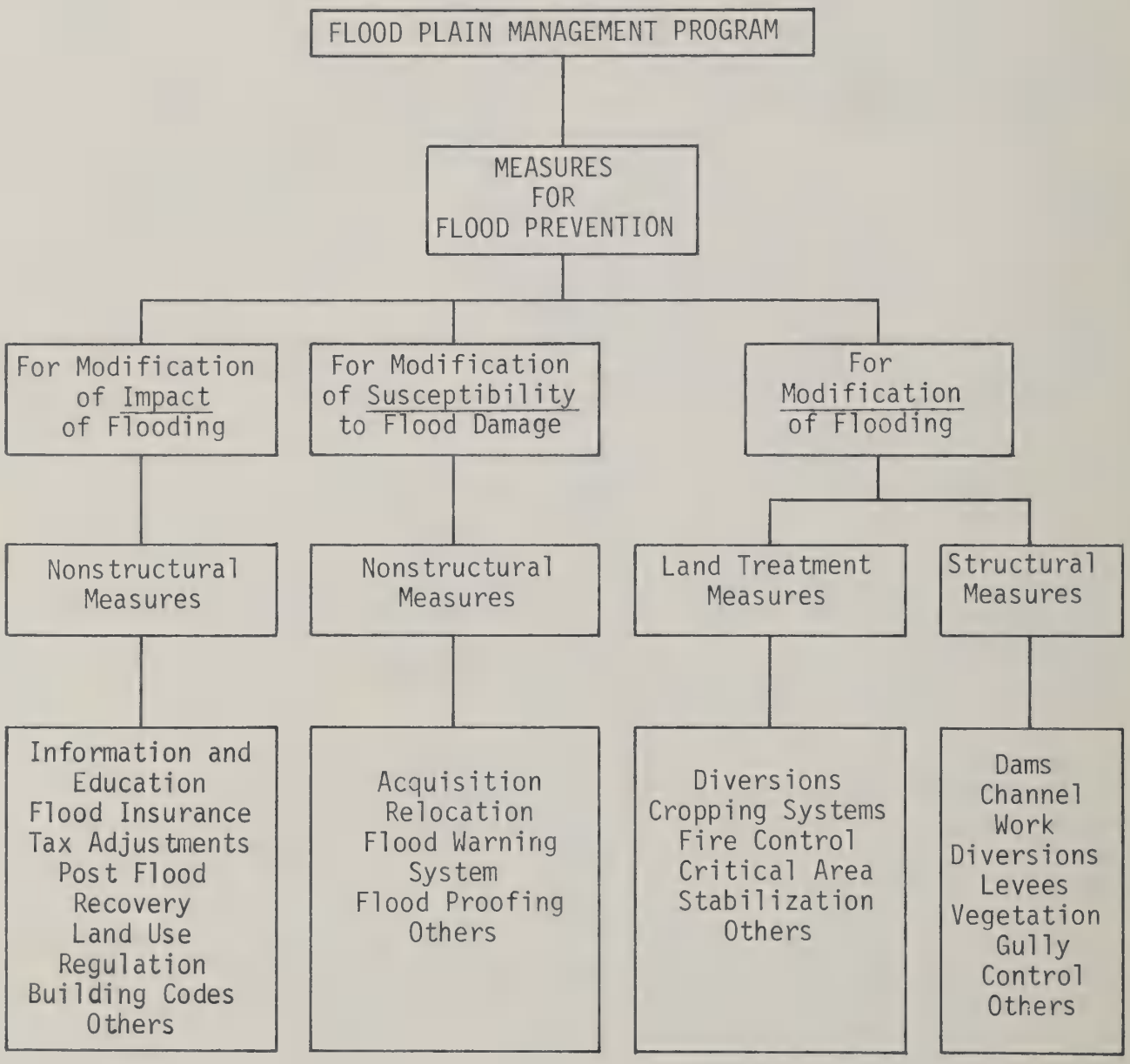
Land treatment measures are an integral part of flood prevention projects because of their physical effect of reducing runoff, erosion, or sedimentation.

Nonstructural measures such as land use and control regulations, building codes, flood insurance, postflood recovery etc., are primarily administrative actions rather than installations. However, such measures may be needed to reduce the impact of flooding, especially in areas which may be subjected to future development pressures.

Nonstructural measures to reduce the susceptibility to flooding include, but are not limited to (1) landrights acquisition in flood plains, (2) relocations, (3) floodproofing, and (4) flood warning. Relocations, as used here, refers to permanent movement of households, property, and/or people out of a flood-prone area.

Structural measures are installed and maintained to control damaging floodwater, sediment, or erosion. Structural measures include, but are not limited to (1) floodwater retarding structures, (2) channel work, (3) levees and dikes, (4) debris and sediment basins, (5) floodways, (6) floodwater diversions, (7) drop spillways, (8) chutes, (9) vegetation, and (10) riprap.

Exhibit D-1 - Wisconsin River Basin



ALTERNATIVES FOR FLOOD PLAIN MANAGEMENT

REGULATORY

Development Policies -- Sound policy and action decisions to prevent construction of streets and utility systems in flood-prone areas, tend to slow development of the flood plains.

Zoning -- Zoning is a legal tool that may be used to implement and enforce the details of the flood plain management program, preserve property values and achieve the most appropriate and beneficial use of available land. Zoning can regulate the use of land and degree of development in flood hazard areas. Effective zoning requires enforcement of the zoning ordinance which in turn depend upon an ordinance that is clear, concise, and thorough.

Subdivision Regulations -- Subdivision regulations can be used by town governments to specify the manner in which land may be subdivided within the entire area under their jurisdiction. Regulations may state the required width of street, requirements for curbs and gutters, size of lots, percentage of open space, size of floodways, and other points pertinent to the welfare of the community.

In reference to flood hazard areas, subdivision regulations may:

(1) Require location of flood-prone areas and floodways to be shown on the plat map.

(2) Require placement of streets and public utilities above a selected flood elevation.

(3) Require installation of adequate drainage facilities.

(4) Prohibit encroachment in floodways or flood hazard areas.

(5) Provide safe building elevations on lots above selected flood heights by means of fill or open structural support.

Building Codes -- The primary purpose of building codes is to set up minimum standards for controlling the design, construction, and quality of materials used in buildings and structures within a given area so that life, health, property, and public welfare are safeguarded. Since it may not be practical to prevent building in all areas subject to flooding, building codes can be used to minimize structural and subsequent damages resulting from inundation. Proper building restriction codes can:

(1) Prevent floatation of buildings from their foundations by specifying adequate anchorage.

(2) Establish basement elevations and minimum first floor elevations consistent with potential flood occurrences.

(3) Prohibit basements in those areas subject to very shallow, frequent flooding where filling and slab construction would prevent virtually all damage.

(4) Require building reinforcement to withstand water pressure or high velocity flow and restrict the use of materials which deteriorate rapidly in the presence of water.

(5) Prohibit equipment that might be hazardous to life when submerged; this includes chemical storage, boilers, and electrical equipment.

Floodway Lines -- Floodway lines are the lateral boundaries of a designated floodway. They are two definitely established lines, one on each side of the stream. Between these lines no construction or filling should be permitted which would impede floodflows.

Land Use Restrictions -- Conservation, scenic or flood control restrictions or easements may be acquired for floodway or flood hazard areas where little or no development is desirable. Land use restrictions can be used to prevent development incompatible with public objectives while allowing continued private ownership of the land. Certain future land use rights such as construction of buildings that are not consistent with good flood plain management could be purchased from present landowners. Permitted uses could be farming, wildlife, low-intensity recreation, and woodland. Land use restrictions may also result in a lowering of the landowner's tax assessment.

Greenbelts -- A term related to the development and retention of stream frontage and flood plains is "greenbelt" or "open space". Permissive use of these public or private lands for pasture or grazing, picnic areas, golf courses, and similar uses would materially reduce or regulate the damage potential in a high-hazard flood plain area.

Flood Insurance -- This program was established under the Housing and Urban Development Act of 1968, and expanded by the Flood Disaster Protection Act of 1973. It provides limited amounts of flood insurance, which was previously unavailable from private insurers, available to property owners by means of a Federal subsidy. In return for this subsidy, the Act requires that State and local governments adopt and enforce land use and control measures that will restrict future development in flood-prone areas to avoid or reduce future flood damage. Flood insurance is available through local insurance agents only after a community applies and is declared eligible by the Flood Insurance Administration, U. S. Department of Housing and Urban Development.

ASSOCIATED MEASURES

Tax Adjustments -- Lowering the tax rate on land dedicated to agriculture, recreation, conservation, or other open-space uses may be effective in preserving existing flood plains or floodways along streams.

Warning Signs -- A method which may be used to discourage development is the erection of flood warning signs in the flood plain area or the prominent posting of previous high water levels. These signs carry no enforcement, but simply serve to inform prospective buyers that a flood hazard exists.

Flood Watch and Warning System -- The National Weather Service of the National Oceanic and Atmospheric Administration issues frequent warnings of potential flood-producing storms. Frequently the flood warnings are preceded by a "severe weather or flood watch".

Local programs can also be implemented to give advance warning to flood-prone areas of potential or impending flood danger. On small watersheds with considerable swamp storage, staff gages set at key locations could be monitored by local personnel. Monitoring could be accomplished by the use of float-activated electronic warning signals connected to the police or fire department. All warning systems should be coordinated with local Civil Defense disaster plans.

CORRECTIVE ACTIONS

Land Treatment -- Vegetative and mechanical land treatment measures can be installed on the uplands to prevent destruction of land by erosion, to reduce the movement of damaging amounts of sediment to the streams, and to reduce the rate and amount of storm runoff. These measures can include: contour farming, cover cropping, contour stripcropping, pasture planting, perennial hay, diversion ditches, terraces, tree planting, selective and improvement tree cutting, and sediment basins. Agricultural lands should be protected and maintained by the appropriate measures. Land in transition to urban development should be protected by appropriate measures. These measures should be maintained to control and reduce the rate and volume of storm runoff and erosion.

Floodwater Retarding Structures -- These structures are earthfill or concrete impoundments that check the uncontrolled flow of floodwater. These structures are located and planned to protect the largest possible area of land subject to flooding, encroach as little as possible on high value lands, and provide a high level of protection to downstream property.

Stream Improvements -- Improvement of a stream channel to increase its capacity to carry floodwater can be accomplished by straightening, deepening, widening, clearing, or by lining the channel so that flooding will be less frequent and severe at that location. Adverse effects to the environment and the possibility of greater flooding downstream, need to be considered.

Levees -- A levee is an embankment or floodwall along the bank of a stream built to confine floodflows to the channel or floodway. Levees are normally used to provide protection to high risk flood-prone areas.

Reservoir Management Program -- Flood control storage may be obtained by regulating existing recreational or other beneficial use reservoirs or lakes. Temporary storage for floodwater is usually made available in the winter and spring months through the lowering of the pool level. Storage capacity can also be made available when there is a threat of a serious flood, providing there are no restrictions or conflicts in rapidly lowering the pool level.

Flood Proofing of Buildings -- Techniques to make existing buildings, contents, and grounds located in flood hazard areas less vulnerable to flood damage are:

(1) Permanent measures built as an integral part of the structure, such as: raising the elevation of the structure, waterproofing of basement and foundation walls, anchorage and reinforcement of floors and walls, and use of water-resistant materials.

(2) Contingency measures which require action to be taken to make them effective such as manually closed sewer valves and removable bulkheads.

(3) Emergency measures carried out during floods according to emergency plans such as sandbagging, pumping, and removal of contents to higher levels.

Flood Plain Reclamation -- This includes the permanent evacuation of developed areas subject to inundation and the acquisition of lands by purchase, the removal of structures, and the relocation of the population from such areas. Such lands could then be returned to a natural wildlife habitat or used for agriculture, low intensity recreation, or other purposes which would not interfere with floodflows.

ALTERNATIVES TO URBAN ENCROACHMENT

Alternatives to urban encroachment in flood-prone areas can be accomplished by several means or techniques. A brief description of some of these techniques follows.

TECHNIQUE	DESCRIPTION
Land Acquisition with Federal or State Financial Assistance:	
Land and Water Conservation Fund Act of 1965 (P.L. 89-578, 78 Stat. 897)	Administered by the U. S. Department of the Interior's Heritage, Recreation, and Conservation Service, the fund allocates money to communities and political subdivisions for planning, acquisition, and development of public outdoor recreational areas. Under the Act, local agencies may be reimbursed up to 50 percent of the costs of purchasing land.
Municipal Law Section 66.36 Wis. Statutes	Any city, village, town, or county may apply for and accept State aids for the acquisition and development of recreational lands and rights in lands for the development of its park system under s. 23.09 (20). Such application shall be made in such a manner as the Department of Natural Resources prescribes. State aid under this section shall be limited to no more than 50 percent of the cost of acquiring, through fee title or through easements, and developing recreational lands and other outdoor recreational facilities.
National Register of Historic Places (National Historic Preservation Act of 1966, 80 Stat. 915, 16 U.S.C. 470)	Under this program the National Park Service can make funds available for the acquisition and development of significant historical, archeological, architectural, and cultural sites.
Revenue Sharing (P.L. 92-572, Acts of 1972)	Open-space lands can be purchased with community funds received through the Federal government's revenue-sharing program.

Other Methods of Land Acquisition:

Gifts of Land	A community, or the State, may acquire land through private donation. Such properties as inland wetlands, nature preserves, wildlife sanctuaries, and recreational land often donated by private owners to the public.
Gifts of Land in Trust	A well-recognized device in Wisconsin for preserving land in its natural state is a charitable gift in trust. Land gifted to a private land trust is insured against being diverted for other municipal purposes.
Eminent Domain	This is usually a means of last resort. Condemnation for storm or sanitary sewers and water courses is provided for in section 32.05, Wis. Statutes. There must be reasonable compensation to the landowner accompanying the taking.

By Regulation:

Wild and Scenic Rivers Act	Certain selected rivers of the Nation which, with their immediate environments, possess outstanding remarkable scenic, recreational, geological, fish and wildlife, historical, cultural, or other similar values, shall be preserved in free-flowing condition, and they and their immediate environments shall be protected for the benefit and enjoyment of present and future generations.
Public Law 90-542	The National wild and scenic rivers system shall comprise rivers (i) that are authorized for inclusion therein by Act of Congress or recreational rivers by or pursuant to an act of the legislature of the State or states through which they flow. Every wild, scenic, or recreational river in its free-flowing condition, or upon restoration to this condition, shall be considered eligible for inclusion in the national wild and scenic rivers system and, if included, shall be classified, designated, and administered as one of the following:

(1) Wild river areas--Those rivers or sections of rivers that are free of impoundments and generally inaccessible except by trail, with watersheds or shorelines essentially primitive and waters unpolluted. These represent vestiges of primitive America.

(2) Scenic river areas--Those rivers or sections of rivers that are free of impoundments, with shorelines or watersheds still largely primitive and shorelines largely undeveloped, but accessible in places by roads.

(3) Recreational river areas--Those rivers or sections of rivers that are readily accessible by road or railroad, that may have some development along their shorelines, and that may have undergone some impoundment or diversion in the past.

Conservation Restrictions:

Conservation Act, Section 23.09, Wis. Statutes

The purpose of this section is to provide an adequate and flexible system for the protection, development and use of forests, fish and game, lakes, streams, plant life, flowers, and other outdoor resources in this State.

Lands, acquisition. Acquire by purchase, lease or agreement, and receive by gifts or devise, lands or waters suitable for the purpose enumerated, and maintain the same for the said purposes; and may condemn lands or waters suitable for such purposes after obtaining approval of the senate and assembly committees on natural resources.

Local Zoning:

The Water Resources Act Chapter 614, NR 115

Wisconsin required counties to enact regulations for the protection of all shorelands in unincorporated areas by January 1, 1968. Shorelands as defined are lands within 1,000 feet (304.8 m) of

	a navigable lake, pond, or flowage and lands within 300 feet (91.4 m) of a river or navigable stream or the landward side of the flood plain whichever distance is greater.
Flood Plain Management Chapter 614, laws of 1965, NR 116	The Wisconsin legislature recognized that flood plain zoning is a necessary tool to protect human life, health, and to minimize property damages and economic losses. Counties, cities, and villages are required by Section 87.30, Wis. Statutes, to adopt reasonable and effective flood plain zoning ordinances within their respective jurisdictions where serious flood damage may occur.
Waterways; maintenance by towns. Section 81.05 Wis. Statutes	The town board of any town in which is situated any waterway suitable for general and useful navigation by boats and launches may, by order to be recorded by the town clerk, adopt the same as a public waterway of the town and may thereupon expend highway funds in the improvement and maintenance of the navigability thereof. But no amount in excess of $200 shall be expended on any such waterway in any year except in pursuance of a special appropriation thereof, voted at the annual town meeting. No town shall become liable in damages by reason of any defect or insufficiency of such a water highway.
Tax Incentives:	
Taxation of Forest Croplands Section 77.01, Wis. Statutes	It is the intent of this chapter to encourage a policy of protecting from destructive or premature cutting the forest growth in this State, and of reproducing and growing for the future adequate crops through sound forestry practices of forest products on lands not more useful for other purposes, so that such lands shall continue to furnish recurring forest crops for commercial use with public hunting and fishing as extra public benefits all in a manner which shall not hamper the towns in which such lands lie from receiving their just tax revenue from such lands.


UNITED STATES DEPARTMENT OF AGRICULTURE
1862
1889
AGRICULTURE IS THE
AND COMMERCE
FOUNDATION OF MANUFACTURE