

INTRODUCTION

WATER BUDGET

30 inches  
PRECIPITATION = 5.5 inches  
RUNOFF + 24.5 inches  
EVAPOTRANSPIRATION + 0  
UNDERFLOW + 0  
CHANGE IN STORAGE

Average annual, from stream-gaging records for the years 1940-69

The difference between ground-water flow into and out of the watershed is estimated to be less than 0.1 inch

Long-term gains in ground-water, surface-water, and soil-moisture storage are assumed to be nearly balanced by long-term losses

I - 2  
WATER ENTERING THE WATERSHED AS PRECIPITATION IS APPROXIMATELY EQUAL TO SURFACE RUNOFF PLUS EVAPOTRANSPIRATION.

The maps show that precipitation decreases but runoff increases from west to east. Runoff increase may be due to thinner glacial deposits in the east and to greater discharge of ground water to the stream valleys in the deeply incised downstream end of the watershed. The amount of underflow entering the watershed from the southeast and southwest is assumed about equal to the underflow leaving the watershed to the south and to the north. No significant areas of ground-water decline are known, indicating that the volume of water in storage is fairly constant.

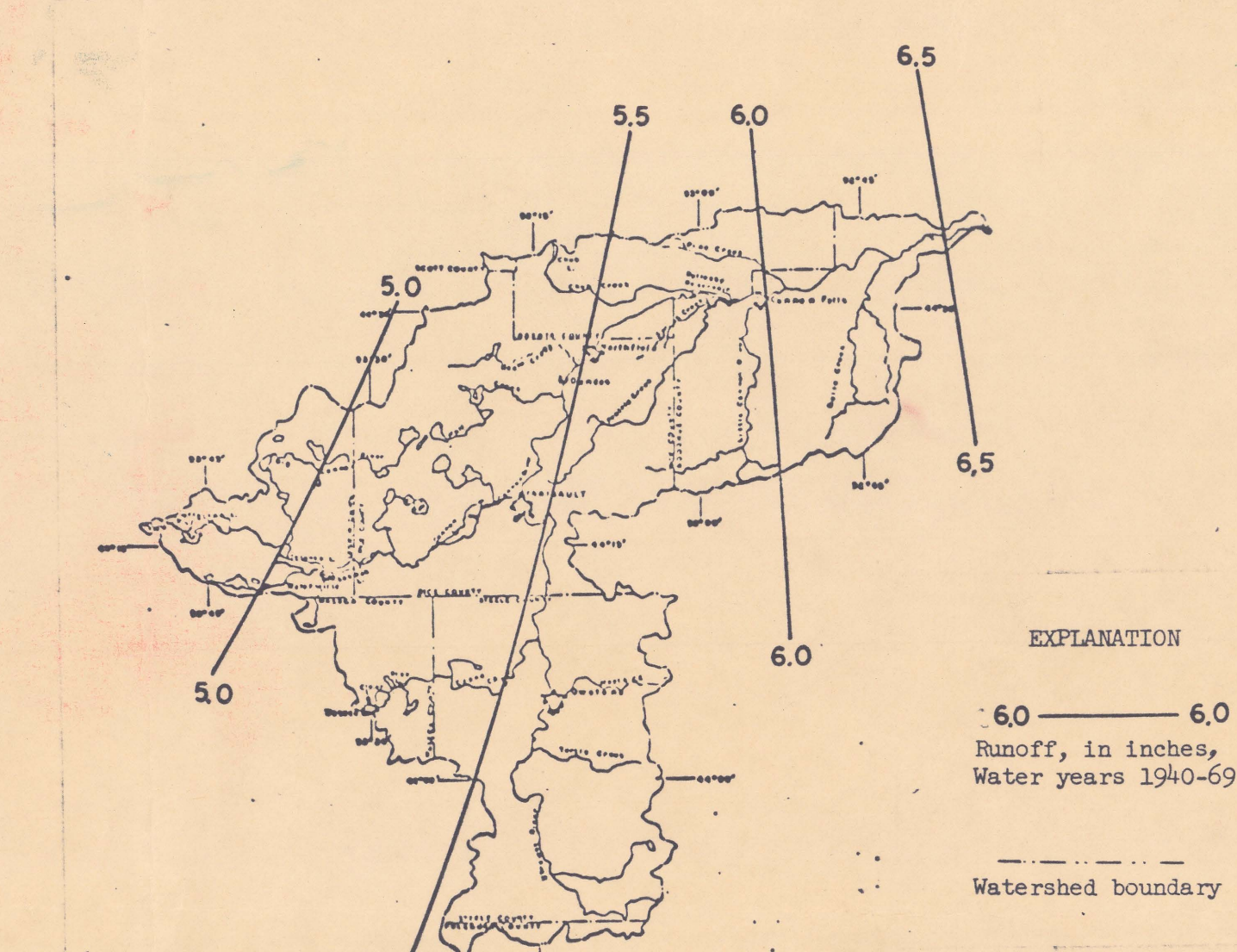
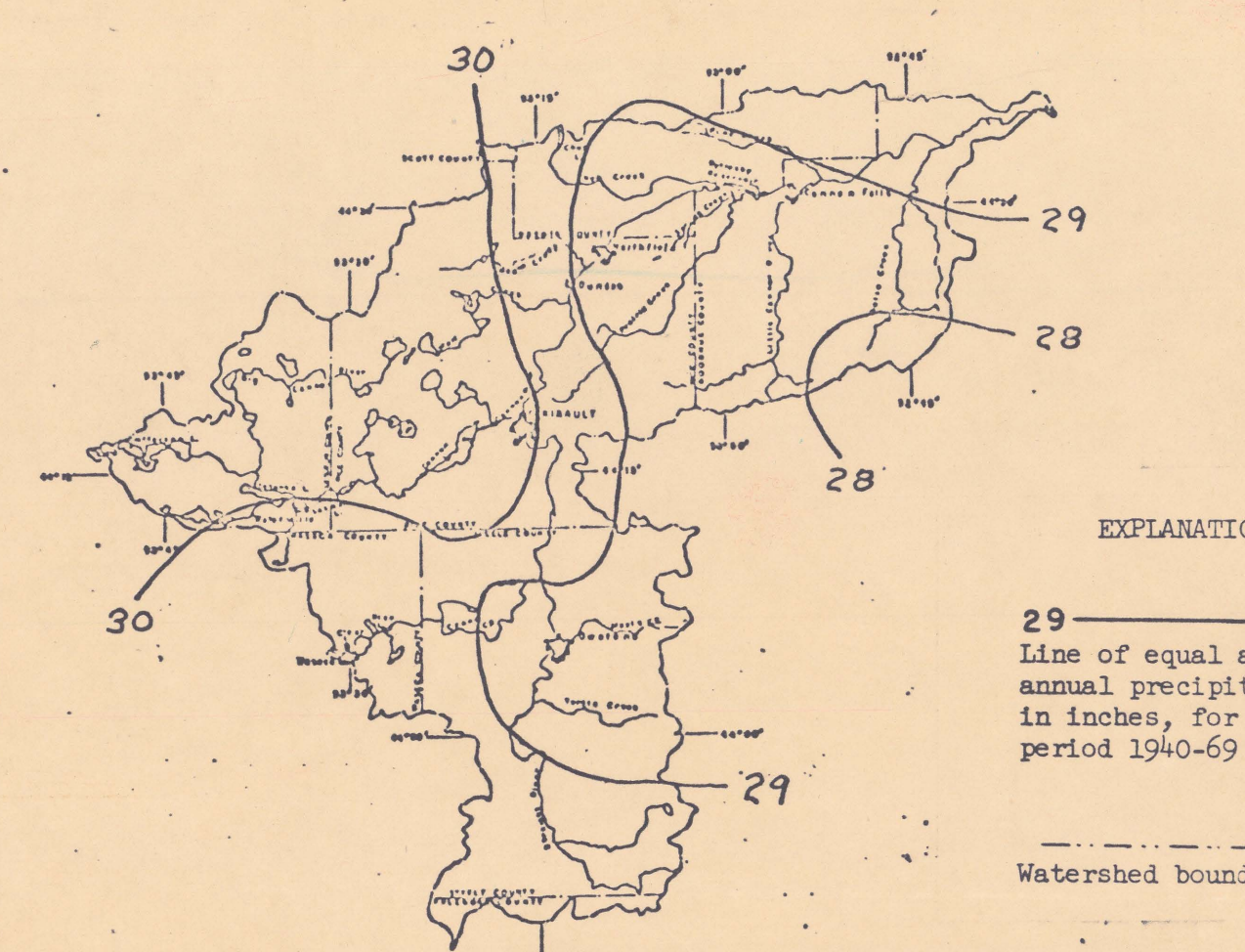
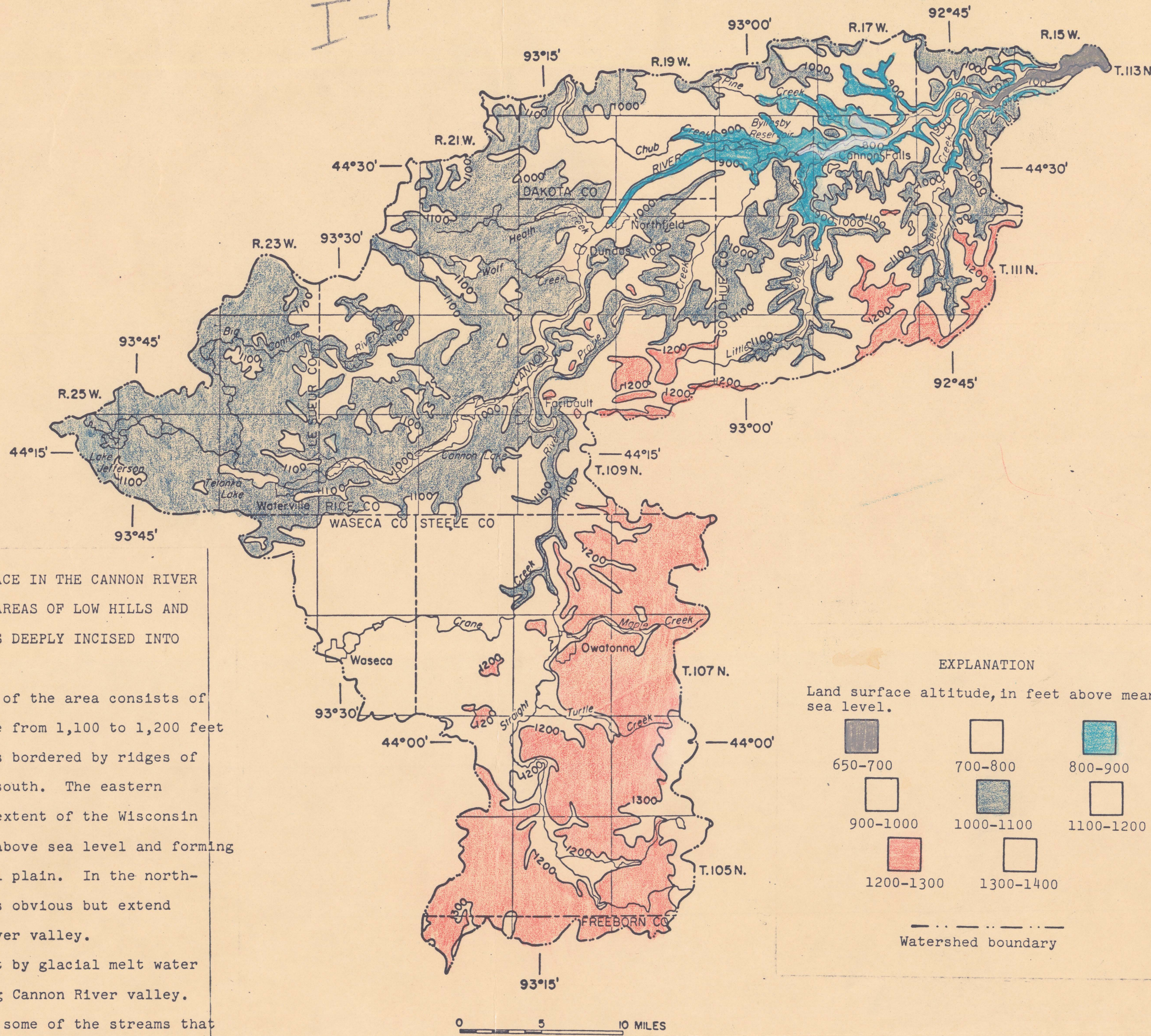
I - 1  
THE 1,462 SQUARE MILES OF LAND SURFACE IN THE CANNON RIVER WATERSHED VARIES CONSIDERABLY FROM AREAS OF LOW HILLS AND PLAINS TO AREAS DOMINATED BY STREAMS DEEPLY INCISED INTO BEDROCK.

Much of the south-central part of the area consists of a till plain that ranges in altitude from 1,100 to 1,200 feet above mean sea level. This plain is bordered by ridges of end moraine on the east, west, and south. The eastern moraine marks the maximum eastward extent of the Wisconsin glacier, rising to over 1,300 feet above sea level and forming ridges 50 to 100 feet above the till plain. In the north-west, ridges of end moraine are less obvious but extend directly north across the Cannon River valley.

The end moraine ridges were cut by glacial melt water which also deepened the pre-existing Cannon River valley. This deeply incised valley captures some of the streams that flow westward off the west side of the end moraines.

East of the end moraines, pre-Wisconsin age glacial deposits are relatively thin and deeply weathered and eroded.

Large glacial melt-water valleys, around Cannon Falls and extending several miles to the west and southwest, are characterized by broad valley floors underlain by outwash sand and gravel. The Cannon River flows out of the watershed and enters the Mississippi River at about 660 feet altitude.



SUMMARY

EVALUATION OF WATER RESOURCES												
		Surface Water			Ground Water							
		Cannon River	Large Lakes	Small lakes and minor streams	Pleistocene		Ordovician					Cambrian
Purpose	Considerations				Glacial sand and gravel	Maquoketa, Dubuque, and Galena Formations	St. Peter Sandstone	Prairie du Chien Group	Jordan Sandstone	St. Lawrence and Franciscan Formations		Iron ore, Galena, and other minerals
Municipal and industrial supply	For a moderate supply, principal needs are:	Adequate supply.	Adequate supply from some lakes for limited use.	Very adequate with development of storage facilities.		Adequate in southern part of watershed where present.	Generally adequate supply where deeply buried.		More than adequate supply throughout area of occurrence.	Locally adequate supply from sandstone layers.		Adequate supply throughout the area.
	Quantity Minimum available surface water supply of 1 cfs per acre yielding 500 gpm. Quality Dissolved solids content less than 500 mg/l. Hardness less than 180 mg/l.	Requires treatment.	Requires treatment.	Requires treatment.	Inadequate supply except for a few outwash areas. Susceptible to pollution.	Hard water, dissolved solids high. Susceptible to pollution especially along stream-beds.	Locally low yields due to very fine sand. Very hard water. Iron high. Sulfate and dissolved solids high locally.		Yield varies because of distribution of sandstone. Susceptible to pollution along surface. Requires treatment. Very hard water. Iron high.	Very hard water. Iron high. Sulfate high locally.	Very hard water. Iron high. Deeply buried in southwest area.	Very hard water. Iron high. Deeply buried in southwest area.
Rural domestic and stock supply	For an adequate farm supply, needs are:	Adequate supply.	Adequate supply.	Adequate for stock.	Locally adequate supply in southwest part of watershed.	Adequate supply where present.	Adequate supply throughout area of occurrence. Generally acceptable quality.	Adequate supply.	Adequate supply. Generally acceptable quality.	Adequate supply. Generally acceptable quality.		Adequate supply.
	Quantity Minimum of 5 gpm. Quality Dissolved solids content less than 1,000 mg/l.	Available only to riparian lands. Requires treatment for domestic use.	Available only to riparian lands. Requires treatment for domestic use.	Available only to riparian lands. Requires treatment for domestic use.	Thin or absent in most areas. Very hard water. Iron generally high.	Hard water.	Very hard water. Iron high.	Very hard water. Iron high.	Very hard water. Iron high.	Very hard water. Iron high.	Very hard water. Iron high.	Very hard water. Iron high. Deeply buried.
Irrigation supply	For an average farm, needs are:	Adequate supply.	Adequate supply from some lakes. Limited use from others.	Adequate supply for limited use from some.	Locally adequate supply in outwash areas. Acceptable quality.	Adequate supply. Generally acceptable quality.	Generally adequate supply except near valley outcrops. Acceptable quality.	Adequate supply except near valley outcrops. Acceptable quality.	Adequate supply. Acceptable quality.	Locally adequate supply. Acceptable quality.		Adequate supply. Acceptable quality.
	Quantity Minimum available surface water supply of 2 cfs during growing season or wells yielding 250 gpm. Quality Dissolved solids content less than 2,000 mg/l. Suitability of water quality for irrigation as indicated by classification of U.S. Dept. of Agriculture.	Available only to riparian lands.	Available only to riparian lands.	Available only to riparian lands.	Excellent migratory waterfowl nesting and feeding areas. Excellent wildlife habitat in marsh areas and along shores. Fish population fairly abundant.	Good migratory waterfowl nesting and feeding areas. Excellent habitat along shores and banks.	Fluctuating water stage.	Very suitable for hunting, fishing, and trapping. Widely distributed. Public access generally available.	Very suitable for hunting and trapping. Widely distributed.	Very suitable for hunting and trapping. Widely distributed.	Very suitable for hunting and trapping. Widely distributed.	Very suitable for hunting and trapping. Widely distributed.
Fish and wildlife habitat	Adequate depth and quality of water for fish in lakes and streams. Excellent wildlife habitat is provided by wetlands-lakes or ponds surrounded by marsh areas. Stream-courses and floodplains along banks.	Suitable for wildlife and fish.	Excellent migratory waterfowl nesting and feeding areas. Excellent wildlife habitat in marsh areas and along shores. Fish population fairly abundant.	Good migratory waterfowl nesting and feeding areas. Excellent habitat along shores and banks.	Excellent migratory waterfowl nesting and feeding areas. Excellent wildlife habitat in marsh areas and along shores. Fish population fairly abundant.	Good migratory waterfowl nesting and feeding areas. Excellent habitat along shores and banks.	Fluctuating water stage.	Very suitable for hunting, fishing, and trapping. Widely distributed. Public access generally available.	Very suitable for hunting and trapping. Widely distributed.	Very suitable for hunting and trapping. Widely distributed.	Very suitable for hunting and trapping. Widely distributed.	Very suitable for hunting and trapping. Widely distributed.
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Recreation	Adequate access to lakes and streams. Availability of areas suitable for hunting, fishing and other water sports. Available resorts, lake cottages, and campgrounds. Adequate values and absence of pollution.	Suitable for hunting, fishing, and canoeing.	Suitable for hunting, fishing, and canoeing.	Suitable for hunting, fishing, and canoeing.	Excellent migratory waterfowl nesting and feeding areas. Excellent wildlife habitat in marsh areas and along shores. Fish population fairly abundant.	Good migratory waterfowl nesting and feeding areas. Excellent habitat along shores and banks.	Fluctuating water stage.	Very suitable for hunting, fishing, and trapping. Widely distributed. Public access generally available.	Very suitable for hunting and trapping. Widely distributed.	Very suitable for hunting and trapping. Widely distributed.	Very suitable for hunting and trapping. Widely distributed.	Very suitable for hunting and trapping. Widely distributed.
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EXPLANATION

Good  
Fair  
Poor

Adequate supply, generally acceptable quality.  
Very hard water. Iron high.

Advantages  
Disadvantages

Overall evaluation for purpose and consideration indicated.

MUNICIPAL SUPPLIES

Municipality	Estimated population served (1970)	Water Use					Aquifer			Water System					Representative quality milligrams per liter				
		Annual industrial use (thousand gallons)	Annual domestic use (thousand gallons)	Total annual purpose (thousand gallons)	Average daily purpose (thousand gallons)	Per capita domestic use (gallons per day)	Name	Symbol	Thickness penetrated (feet)	Number of wells	Approximate well depth (feet)	Usual pumping rate (gpm)	Specific capacity (gpm per foot of drawdown)	Daily plant capacity (thousand gallons)	Iron (ppm)	Sulfate (SO <sub>4</sub> )	Chloride (Cl)	Dissolved solids, calculated	Hardness as CaCO <sub>3</sub>
Cannon Falls	2,072	---	47,300	47,300	129	62	Jordan	Op	105	2	640	500	42	1,325	0.19	23	2.3	330	290
Elko	115	---	2,900	2,900	8	70	Prairie du Chien	Op	167	1	487	200	7.6	288	.59	40	3.0	440	410
Ellendale	569	2,400	21,700	24,100	66	104	Maquoketa to Galena	Op	100	2	400	150	7.5	468	1.8	45	3.0	330	290
Elysian	445	---	5,900	5,900	16	37	St. Peter	Op	23	1	317	54	---	78	---	---	---	---	---
Faribault	16,595	66,000	594,000	660,000	1,800	98	Jordan to Iron-Galena	Op	100	1	750	1,650	15	9,986	.62	25	1.1	358	330
							Prairie du Chien	Op	300	4	410	1,000	46		.68	35	1.0	370	330
							Jordan	Op	61										
Hope	120	4,200	2,100	6,300	17	48	Galena	Op	121	1	230	88	---	127	1.1	18	.3	380	330
Kilkenny	182	730	6,600	7,330	20	99	Jordan	Op	72	1	380	---	---	132	.06	25	1.1	480	390
Lonsdale	622	---	16,300	16,300	45	72	Iron-Galena to Maquoketa	Op	300	2	760	215	8.0	454	2.5	35	4.1	540	370
Medford	690	---	28,500	28,500	78	113	St. Peter	Op	480	1	588	170	---	345	.70	41	4.5	500	420
							Prairie du Chien	Op											
Morristown	659	---	14,000	14,000	35	53	St. Peter	Op	84	1	184	250	---	360	3.1	33	1.2	460	390
Nerstrand	231	---	3,600	3,600	10	43	Prairie du Chien	Op	245	1	478	65	---	94	.03	30	2.5	300	270
New Trier	153	---	2,200	2,200	6	39	Jordan	Op	105	1	560	150	30	216	<.02	18	5.9	---	200
Northfield	10,235	---	271,000	271,000	743	73	Prairie du Chien	Op	260	2	400	1,000	24	4,608	.18	29	4.1	370	230
							Jordan	Op	43	45	1	418	1,200	---	.33	19	1.5	240	300
Owatonna	15,341	299,000	751,000	1,050,000	2,900	134	Prairie du Chien	Op	300	5	700	1,150	40	8,208	.12	28	1.1	277	240
							Jordan	Op	41										
Waterville	1,539	---	34,500	34,500	95	61	St. Peter	Op	86	1	300	250	10	720	2.6	0	4.4	---	270
							Jordan	Op	41	---	1	615	250	12	---	---	---	---	---
Total	49,568	378,330	1,801,600	2,179,930	5,968	100													

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WATER RESOURCES OF THE CANNON RIVER WATERSHED, SOUTHEASTERN MINNESOTA

By

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Minnesota (Cannon River basin). Water. U.S. 1973.

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