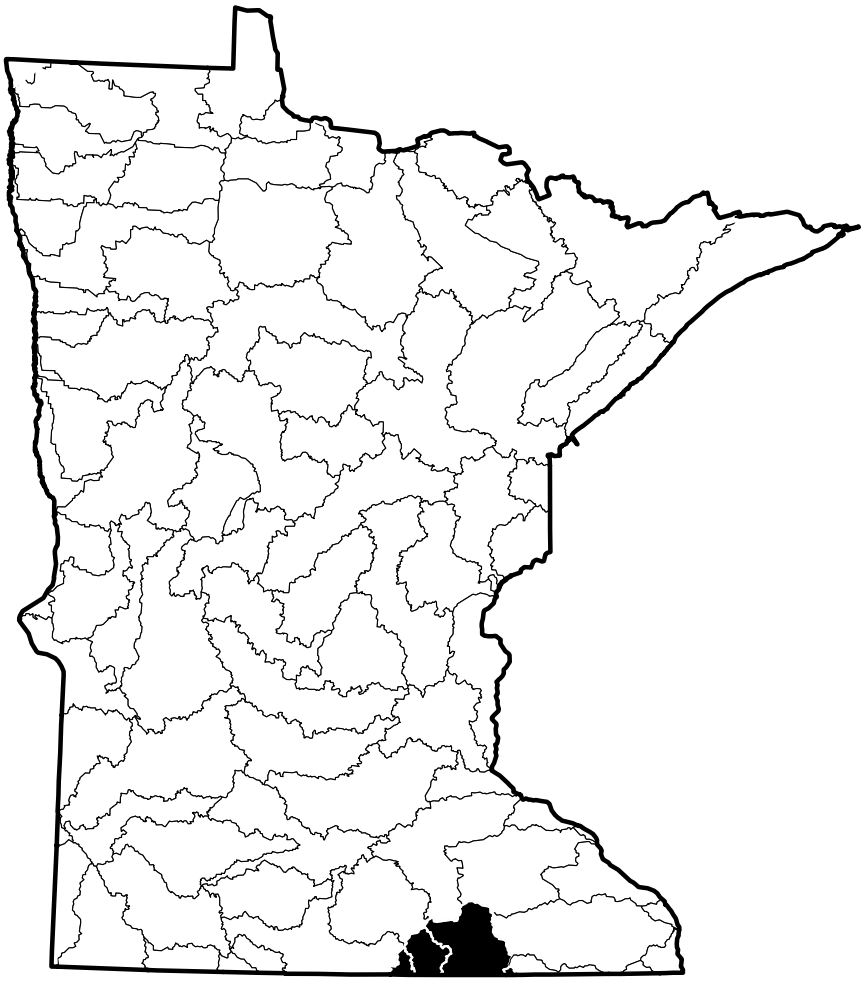
OFR 99-471

PHYSICAL CHARACTERISTICS OF STREAM SUBBASINS IN THE UPPER WAPSIPINICON RIVER, UPPER CEDAR RIVER, SHELL ROCK RIVER, AND WINNEBAGO RIVER BASINS, SOUTHERN MINNESOTA AND NORTHERN IOWA

By Christopher A. Sanocki

Open-File Report 99-471



Prepared in cooperation with the

Minnesota Department of Transportation

Mounds View, Minnesota

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PHYSICAL CHARACTERISTICS OF STREAM SUBBASINS IN THE UPPER WAPSIPINICON RIVER, UPPER CEDAR RIVER, SHELL ROCK RIVER, AND WINNEBAGO RIVER, BASINS, SOUTHEASTERN MINNESOTA

OFR 99-471

Physical Characteristics of Stream Subbasins in the Upper Wapsipinicon River, Upper Cedar River, Shell Rock River, and Winnebago River Basins, Southern Minnesota and Northern Iowa

By Christopher A. Sanocki

Abstract

Data that describe the physical characteristics of stream subbasins upstream from selected sites on streams in the Upper Wapsipinicon River, Upper Cedar River, Shell Rock River, and Winnebago River Basins, located in southern Minnesota and northern Iowa are presented in this report. The physical characteristics are the drainage area of the subbasin, the percentage area of the subbasin covered only by lakes, the percentage area of the subbasin covered by both lakes and marsh, the main-channel length, and the main-channel slope. Stream sites include outlets of subbasins of at least 5 square miles, and locations of U.S. Geological Survey high-flow, and continuous-record gaging stations.

Introduction

This is the 16th report in a series detailing subbasin characteristics of streams in Minnesota and adjacent states. The four hydrologic units presented in this report cover only the area of the basins that have some upstream drainage area within Minnesota. The upstream drainage area for each watercourse was determined at the Minnesota State line. In some instances the drainage area included flow from across state lines see plate 1.

The Upper Wapsipinicon River Basin drains an area of 12.94 square miles and is represented by hydrologic accounting unit 07080102 (U.S. Geological Survey, 1974). The Upper Cedar River Basin drains an area of 714.88 square miles and is represented by hydrologic accounting unit 07080201 (U.S. Geological Survey, 1974). The Shell Rock River Basin drains an area of 254.81 square miles and is represented by hydrologic accounting unit 07080202 (U.S. Geological Survey, 1974). The Winnebago River Basin drains an area of 76.65 square miles and is represented by hydrologic accounting unit 07080203 (U.S. Geological Survey, 1974). The Upper Wapsipinicon River, Upper Cedar River, Shell Rock River, and Winnebago River Basins includes parts of Dodge, Faribault, Freeborn, Mitchell, Mower, Steele, Winnebago, Worth Counties in southern Minnesota and northern Iowa.

Selected data for sites on streams at outlets of subbasins larger than about 5 square miles; at locations of U.S. Geological Survey (USGS) high-flow, and continuous-record gaging stations located in the Upper Wapsipinicon River, Upper Cedar River, Shell Rock River, and Winnebago River Basins are presented in this report. This report was prepared in cooperation with the Minnesota Department of Transportation.

Acknowledgments

Banette Kritzky, a graduate student at St. Cloud State University and Brian Fischer a graduate student at University of Minnesota, did much of the digitizing and assisted in the preparation of this report. These contributions were essential for the completion of this report.

Methods

USGS 7-1/2 minute series topographic maps were used as source maps to obtain the areas for the subbasin boundaries, the main-channel length, and the contour elevation points used in this report. Paper copies of the maps were used. Lake and marsh data were obtained from U.S. Fish and Wildlife Service National Wetlands Inventory Data (U.S. Fish & Wildlife Service, 1981-present). A geographic information system (GIS) was used to define the geographic location and extent of the

subbasins, lakes, marshes, main-channels, and elevation points. Data digitized from paper copies were in error by no more than twice the horizontal accuracy of National Mapping Standards of 40 feet (Thompson, 1987, p. 104). All thematic (digitized) data were projected into an Albers Equal-Area projection for storage and analysis.

Subbasin boundaries were delineated on the basis of anthropogenic activities and topographic contours. Anthropogenic activities, such as the installation of storm sewers, the drainage of wetlands, and the diversion of streams, may alter the drainage area of a stream. Data from field inspections and recent drainage-ditch maps, therefore, were transferred to the topographic maps. The subbasin boundaries were digitized by the Minnesota Department of Natural Resources (DNR), and the USGS, Minnesota District, using a GIS.

Lake and marsh boundaries were overlaid on the subbasin boundaries to associate each lake and marsh with a subbasin. The total area of lakes and marshes within each subbasin was calculated by the GIS. Total marsh area plus total lake area is defined as storage area.

Main channels were delineated for each subbasin on the 7-1/2 minute topographic maps starting at the outflow of the subbasin and continuing upstream. Whenever the main channel joined with another stream, the stream upstream of the junction that drained the largest area was selected as the main channel. The main channel, which represents the watercourse that drains the greatest area, is continuous and is defined as a single trace that passes through marshes, lakes, and midline of rivers and braided streams from the basin outlet to an endpoint in the basin, generally at the basin divide. The main channels were digitized by the Minnesota Department of Transportation, using a computer aided drafting system and transferred to the GIS. Stream extensions that represent a portion of the main channel from the end of the mapped stream (blue line on 7-1/2 minute topographic maps) to an endpoint within the basin, generally at the basin divide, were digitized by USGS, Minnesota District, using a GIS. The main-channel data were overlaid onto the subbasin data to associate each main channel with its subbasin.

Elevation points were digitized at the intersection of topographic contour lines and main channels. The elevation data were digitized using a GIS. The elevation data was overlaid onto the main channel data to associate each elevation data point with a main channel. Two points on the main-channel, at 10 percent and at 85 percent of the main channel length from the basin outlet to the drainage divide, were located by the GIS. The elevations of these two points were interpolated from the digitized elevation data. Main-channel slope was calculated by dividing the difference in elevation between these points by the distance along the stream channel between these points.

Physical Characteristics of Upper Wapsipinicon River, Upper Cedar River, Shell Rock River, and Winnebago River Basins

Physical characteristics determined for each of the subbasins shown on plate 1 are presented in table 1. Subbasins are presented in order from headwaters to mouth. The rank of the subbasin stream is shown by indentation; whenever two subbasin streams joined, the stream draining the least cumulative area was assigned a lower rank and indented in the table.

The data for drainage area, and main-channel length are reported using three significant figures or rounded to the nearest one-hundredth of a unit. The data for lake area and storage area are reported using two significant figures or rounded to the nearest one-tenth of a percent. The data for main-channel slope is reported to the nearest one-tenth of a foot per mile.

The following is an explanation of the terms used in table 1:

Subbasin number. A seven digit number based on the Minnesota Common Stream and Watershed Numbering System (Minnesota Department of Natural Resources, 1981). The first two digits identify the follwing: Upper Wapsipinicon (47), Upper Cedar (48), Shell Rock (49), and Winnebago (50) River Basins. The following three digits are arbitrary and were assigned by the DNR. The last two digits were added by the USGS, Minnesota District,, to identify additional subdivisions to the DNR's watersheds at locations of USGS gaging stations and to identify noncontributing areas.

Stream name. The name of the stream or ditch shown on 7-1/2 minute topographic maps. The relative position of the subbasin above other subbasins, streams, and gaging stations.

Outlet location. The U.S. Public Lands Survey System is used to describe the location where the stream exits the subbasin, down to quarter-quarter section. The description includes quarter-quarter section, section, township, and range.

Drainage area. That area, measured on a horizontal plane, enclosed by a topographic divide, within which direct surface runoff from precipitation normally flows by gravity into a watercourse above a specific point. This may include closed basins and other areas that do not contribute directly to surface runoff.

Lake area. The percentage of the drainage area labeled lacustrine (lakes) on U.S. Fish and Wildlife Service National Wetlands Inventory Data.

Storage area. The percentage of a drainage area labeled lacustrine (lakes) and palustrine (marsh) on U.S. Fish and Wildlife Service National Wetlands Inventory Data. Marsh areas shown on plate 1 are from USGS 1:100,000 digital line graph data, 1993.

Main-channel length. The total length of the main channel from the basin outlet to a point within the basin (generally at the basin divide) representing the watercourse that drains the greatest area.

Main-channel slope. The average slope of the watercourse between the points at 10 and at 85 percent of the distance along the main channel from the basin outlet to the drainage divide.

Stream extension. A representation of the main channel from the end of the mapped stream line (blue line on 7-1/2 minute topographic maps) to an endpoint within the basin, generally at the basin divide. This is done by interpreting topographic relief so that the extension of the main channel represents the watercourse draining the greatest area.

References Cited

Minnesota Department of Natural Resources, 1981, The common stream and watershed numbering system: Minnesota Department of Natural Resources Stream Inventory and Data Retrieval Systems Report 7002, unpaged.

Thompson, M.M., 1987, Maps for America, 3d edition: U.S. Geological Survey, 265 p.

U.S. Geological Survey, 1974, Hydrologic unit map--1974 State of Minnesota: 1 plate, scale 1:500,000.

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Table 1.—Physical characteristic data for the Upper Wapsipinicon, Upper Cedar, Shell Rock, and Winnebago River Basins

Basin number	Stream name and location	Outlet location				By subbasin			Cumulative to mouth of basin				
		Quarter-quarter section	Section	Town-ship	Range	Drainage area (square miles)	Lake area (percent of subbasin area)	Storage area (percent of subbasin area)	Drainage area (square miles)	Lake area (percent of total area)	Storage area (percent of total area)	Main channel length (miles)	Main channel slope (foot per mile)
	First Rank Second Rank Third Rank Fourth Rank Fifth Rank												
4700100	Wapsipinicon River at Minnesota/Iowa border	SE SE	31	101N	15W	8.54	0.0	0.1	8.54	0.0	0.1	7.09	10.3
4700101	Unnamed streamline extension at Minnesota/Iowa border	SW SW	32	101N	15W	0.10	0.0	0.0	0.10	0.0	0.0	4.75	18.7
4700200	Unnamed tributary at Minnesota/Iowa border	SE SW	32	101N	15W	2.07	0.0	0.0	2.07	0.0	0.0	13.3	6.0
4700201	Unnamed tributary at Minnesota/Iowa border	SE SW	32	101N	15W	0.97	0.0	0.9	0.97	0.0	0.9	8.52	11.7
4700202	Unnamed tributary at Minnesota/Iowa border	SW SW	34	101N	15R	0.83	0.0	2.4	0.83	0.0	2.4	14.9	5.5
4700203	Unnamed streamline extension at Minnesota/Iowa border	SW SW	35	101N	15W	0.21	0.0	0.0	0.21	0.0	0.0	9.50	12.7
4700204	Unnamed tributary at Minnesota/Iowa border	SW SW	35	101N	15W	0.18	0.0	0.0	0.18	0.0	0.0	17.6	5.2
4700205	Unnamed streamline extension at Minnesota/Iowa border	SW SW	36	101N	15W	0.04	0.0	0.0	0.04	0.0	0.0	5.88	6.4
4800100	Cedar River above named tributary basin 4805700	NW NW	28	105N	18W	12.4	0.0	0.7	12.4	0.0	0.7	7.09	10.3
4805700	Unnamed tributary above Cedar River	NW NW	28	105N	18W	6.79	0.0	0.6	6.79	0.0	0.6	4.75	18.7
4805602	Cedar River above unamed tributary basin 4805500	SE NW	25	105N	18W	8.28	0.0	1.3	27.4	0.0	0.8	13.3	6.0
4805500	Unamed tributary above Cedar River	NE NE	26	105N	18W	6.76	0.0	0.4	6.76	0.0	0.4	8.52	11.7
4805601	Cedar River above unnamed tributary basin 4803700	NW NW	35	105N	18W	1.78	0.0	3.4	36.0	0.0	0.9	14.9	5.5
4803700	Unnamed tributary above Cedar River	NW NW	35	105N	18W	12.6	0.0	1.0	12.6	0.0	1.0	9.50	12.7
4805600	Cedar River above Little Cedar River	NW NW	28	105N	18W	2.06	0.0	5.6	50.7	0.0	1.1	17.6	5.2
4850200	Westfield-Ripley Ditch above Little Cedar River	SW SW	09	105N	18W	6.49	0.0	0.1	6.49	0.0	0.1	5.88	6.4
4805300	Unnamed tributary above Little Cedar River	SW SW	09	105N	18W	5.66	0.0	0.1	5.66	0.0	0.1	6.43	10.0
4805400	Little Cedar River above Cedar River	SE NW	28	105N	18W	9.44	0.0	0.9	21.6	0.0	0.4	10.3	5.8
4803900	Green Valley Ditch above Cedar Creek	SE SE	29	105N	19W	9.76	0.0	0.6	9.76	0.0	0.6	6.34	8.3

Table 1.—Physical characteristic data for the Upper Wapsipinicon, Upper Cedar, Shell Rock, and Winnebago River Basins—Continued

Basin number	Stream name and location	Outlet location				By subbasin			Cumulative to mouth of basin				
		Quarter-quarter section	Section	Township	Range	Drainage area (square miles)	Lake area (percent of subbasin area)	Storage area (percent of subbasin area)	Drainage area (square miles)	Lake area (percent of total area)	Storage area (percent of total area)	Main channel length (miles)	Main channel slope (foot per mile)
	First Rank / Second Rank / Third Rank / Fourth Rank / Fifth Rank												
4800200	Unnamed tributary above Roberts Creek	NW SW	04	103N	17W	14.9	0.0	1.5	14.8	0.0	1.5	11.1	11.9
4800301	Roberts Creek above unnamed tributary basin 4800200	NW SW	04	103N	17W	9.35	0.0	0.9	9.35	0.0	0.9	7.23	20.1
4803800	Unnamed tributary above Roberts Creek	SW SE	36	104N	18W	11.1	0.0	1.1	11.2	0.0	1.1	7.70	12.7
4800300	Roberts Creek above Cedar River	SE NE	02	103N	18W	3.68	0.0	5.0	39.0	0.0	1.5	16.9	8.8
4802300	Cedar River above unnamed tributary basin 4802200	NE NW	11	103N	18W	38.6	0.0	2.1	160.	0.0	1.3	30.4	3.6
4802200	Unnamed tributary above Cedar River	NE1/3NW	11	103N	18W	5.25	0.0	0.9	5.25	0.0	0.9	5.91	9.5
4802500	Judicial Ditch No. 5 above Cedar River (at Ramsey Mill Pond)	NE NW	23	103N	18W	12.3	0.0	1.0	12.2	0.0	1.0	8.23	8.9
4802100	Cedar River above Murphy Creek	NW NE	34	103N	18W	7.72	1.8	7.8	185.	0.1	1.6	36.0	3.1
4802600	Murphy Creek above Cedar River	NW NE	34	103N	18W	6.70	0.0	1.0	6.70	0.0	1.0	7.12	9.5
4800400	Wolf Creek above Cedar River	SW NE	34	103N	18W	11.9	0.0	1.9	11.9	0.0	1.9	13.3	13.0
4802003	Cedar River above Dobbins Creek	NE SW	02	102N	18W	1.54	3.8	6.0	205.	0.1	1.6	38.4	3.2
4800600	Unnamed tributary above Dobbins Creek	SW SE	36	102N	18W	17.5	0.0	1.9	17.5	0.0	1.9	12.8	11.3
4800500	Dobbins Creek above Cedar River	NE SW	02	102N	18W	21.0	0.3	2.2	38.5	0.2	2.1	19.7	8.7
4802002	Cedar River above Turtle Creek	SW SE	10	102N	18W	0.76	0.0	1.8	244.	0.1	1.7	40.3	3.1
4804400	County Ditch No. 8 above Geneva Lake	NE SE	18	104N	20W	11.9	0.0	2.9	11.9	0.0	2.9	13.0	6.2
4804300	Turtle Creek (Judicial Ditch No. 24) above Knotvold Branch	NW NW	34	104N	20W	28.5	8.8	12.0	40.4	6.2	9.3	13.0	6.2
4804500	Turtle Creek (Judicial Ditch No. 24) above Mud Creek	NW SW	35	104N	20W	7.70	0.0	0.1	48.1	5.2	7.9	14.6	5.4

Table 1.—Physical characteristic data for the Upper Wapsipinicon, Upper Cedar, Shell Rock, and Winnebago River Basins—Continued

Basin number	Stream name and location	Outlet location				By subbasin			Cumulative to mouth of basin				
		Quarter-quarter section	Section	Town-ship	Range	Drainage area (square miles)	Lake area (percent of subbasin area)	Storage area (percent of subbasin area)	Drainage area (square miles)	Lake area (percent of total area)	Storage area (percent of total area)	Main channel length (miles)	Main channel slope (foot per mile)
	First Rank / Second Rank / Third Rank / Fourth Rank / Fifth Rank												
4804200	Mud Creek above Turtle Creek (Judicial Ditch No. 24)	NW SW	35	104N	20W	12.9	0.0	0.6	12.9	0.0	0.6	9.67	8.0
4805100	Unnamed tributary above Deer Creek	NE SE	06	103N	19W	5.06	0.0	0.9	5.06	0.0	0.9	4.03	20.9
4804100	Unnamed tributary above basin 4804200	NW SE	31	104N	19W	6.16	0.0	0.3	6.16	0.0	0.3	6.48	13.6
4802400	Deer Creek above basin 4804100	NE SE	06	103N	19W	19.8	0.0	1.6	31.0	0.0	1.3	12.4	8.6
4804900	Judicial Ditch No. 24B above Turtle Creek	NW SW	13	103N	20W	15.3	0.0	0.3	15.3	0.0	0.3	7.99	11.2
4804800	Judicial Ditch No. 18 above Judicial Ditch No. 24	NE NE	16	103N	20W	6.44	0.0	0.0	6.44	0.0	0.0	7.90	14.0
4804700	Judicial Ditch No. 24A above Turtle Creek	NE NE	14	103N	20W	5.73	0.0	0.1	12.2	0.0	0.1	7.90	14.0
4804600	Turtle Creek above subbasin 4802700	SW NW	18	103N	19W	4.81	0.0	0.1	124.	2.0	3.5	18.7	4.1
4802700	Turtle Creek above Cedar River	SW SE	10	102N	18W	29.3	0.5	2.6	154.	1.7	3.3	32.4	2.2
4802001	Cedar River above gaging station at Austin: station number is 05457000	NE SE	15	102N	18W	1.13	0.0	1.3	399.	0.7	2.3	41.5	3.1
4802000	Cedar River above Rose Creek	SW NE	27	102N	18W	9.63	0.0	2.6	409.	0.7	2.3	43.3	3.1
4800900	Schwerin Creek above Rose Creek	NE NE	04	102N	16W	9.35	0.0	1.4	9.35	0.0	1.4	7.29	14.0
4800801	Rose Creek above gaging station near Dexter: station number is 05457080	SE SW	22	103N	16W	0.94	0.0	2.8	0.94	0.0	2.8	3.55	24.1
4800800	Rose Creek above Schwerin Creek	NE NE	04	102N	16W	7.83	0.0	1.4	8.77	0.0	1.5	5.99	18.0
4800700	Rose Creek above unnamed tributary basin 4802800	SE NW	30	102N	17W	31.7	0.0	3.1	49.9	0.0	2.5	25.0	6.9
4802800	Unnamed tributary above Rose Creek	SE NW	30	102N	17W	9.35	0.0	0.7	9.35	0.0	0.7	6.23	14.0
4801900	Rose Creek above Cedar River	SW NE	27	102N	18W	6.90	0.0	4.0	66.1	0.0	2.4	29.1	6.7
4803100	Unnamed tributary above Orchard Creek	SE SW	29	102N	18W	10.8	0.0	0.5	10.8	0.0	0.5	7.26	12.4

Table 1.—Physical characteristic data for the Upper Wapsipinicon, Upper Cedar, Shell Rock, and Winnebago River Basins—Continued

Basin number	Stream name and location	Outlet location				By subbasin			Cumulative to mouth of basin				
		Quarter-quarter section	Section	Town-ship	Range	Drainage area (square miles)	Lake area (percent of subbasin area)	Storage area (percent of subbasin area)	Drainage area (square miles)	Lake area (percent of total area)	Storage area (percent of total area)	Main channel length (miles)	Main channel slope (foot per mile)
	First Rank / Second Rank / Third Rank / Fourth Rank / Fifth Rank												
4802900	Unnamed tributary above Orchard Creek	SW SE	29	102N	18W	9.17	0.0	0.1	9.17	0.0	0.1	8.62	9.2
4803000	Orchard Creek above Cedar River	SE NW	04	101N	18W	11.9	0.0	0.3	31.9	0.0	0.3	10.0	10.5
4801800	Unnamed tributary above Cedar River	NW SE	04	101N	18W	10.5	0.0	2.6	10.5	0.0	2.6	7.49	9.2
4803500	Unnamed tributary above Cedar River	NE SW	28	101N	18W	6.47	0.0	1.0	6.47	0.0	1.0	6.82	11.6
4803200	Cedar River above Woodbury Creek	SE NW	33	101N	18W	20.5	0.0	1.0	544.	0.5	2.1	53.7	3.1
4805000	Mud lake Creek above Woodbury Creek	NW NW	18	101N	18W	14.5	0.0	2.3	14.5	0.0	2.3	10.3	8.0
4803300	Woodbury Creek above Mud Lake Creek	NW NW	18	101N	18W	12.8	0.0	0.4	12.8	0.0	0.4	11.0	7.6
4803400	Woodbury Creek above Cedar River	SE NW	33	101N	18W	14.7	0.0	0.2	42.0	0.0	1.0	15.4	7.5
4803600	Cedar River at Minnesota/Iowa border	SE SW	33	101N	18W	0.61	0.0	0.2	587.	0.5	2.1	54.4	3.1
4801201	Unnamed tributary above unnamed tributary (at Adams MN)	NE SW	11	101N	16W	13.1	0.0	1.8	13.1	0.0	1.8	8.85	13.0
4801100	Unnamed tributary above unnamed tributary (at Adams MN)	NE SW	11	101N	16W	10.8	0.0	1.2	10.8	0.0	1.2	9.33	12.0
4801200	Unnamed tributary above Little Cedar River	SE SW	09	101N	16W	5.83	0.0	2.9	29.7	0.0	1.8	9.62	12.3
4801000	Little Cedar River above unnamed tributary basin 4801200	SE SW	09	101N	16W	9.25	0.0	1.7	9.25	0.0	1.7	5.97	13.0
4801301	Little Cedar River above gaging station near Johnsburg: station number is 05457778	NW NE	33	101N	16W	6.88	0.0	7.7	45.8	0.0	2.7	15.3	9.2
4801300	Little Cedar River at Minnesota/Iowa border	SE SE	33	101N	16W	1.36	0.0	7.8	47.1	0.0	2.8	8.49	13.4
4801700	Otter Creek above unnamed tributary basin 4801500	NW NE	28	101N	17W	17.7	0.0	3.0	17.7	0.0	3.0	8.20	8.6

Table 1.—Physical characteristic data for the Upper Wapsipinicon, Upper Cedar, Shell Rock, and Winnebago River Basins—Continued

Basin number	Stream name and location	Outlet location				By subbasin			Cumulative to mouth of basin				
		Quarter-quarter section	Section	Town-ship	Range	Drainage area (square miles)	Lake area (percent of subbasin area)	Storage area (percent of subbasin area)	Drainage area (square miles)	Lake area (percent of total area)	Storage area (percent of total area)	Main channel length (miles)	Main channel slope (foot per mile)
	First Rank / Second Rank / Third Rank / Fourth Rank / Fifth Rank												
4801500	Unnamed tributary above Otter Creek	NW NE	28	101N	17W	10.9	0.0	0.5	10.9	0.0	0.5	5.70	9.4
4801600	Otter Creek at Minnesota/Iowa border	SE SE	36	101N	18W	9.52	0.0	2.0	38.2	0.0	2.1	14.8	6.5
4805900	Unnamed tributary at Minnesota/Iowa border	SE SE	36	101N	20W	3.40	0.0	0.3	3.40	0.0	0.3	2.21	18.9
4806000	Unnamed tributary at Minnesota/Iowa border	SE SE	32	101N	19W	1.93	0.0	2.8	1.93	0.0	2.8	3.52	18.4
4804000	Deer Creek at Minnesota/Iowa border	SW SW	33	101N	19W	19.7	0.0	0.4	19.7	0.0	0.4	9.14	7.2
4805800	Unnamed tributary at Minnesota/Iowa border	SE SE	35	101N	19W	4.61	0.0	0.4	4.61	0.0	0.4	4.71	8.5
4806100	Unnamed tributary at Minnesota/Iowa border	SW SW	34	101N	18W	0.58	0.0	4.9	0.58	0.0	4.9	1.38	25.2
4806200	Unnamed tributary at Minnesota/Iowa border	SW SW	34	101N	18W	0.29	0.0	8.4	0.29	0.0	8.4	1.23	22.6
4806300	Unnamed tirbutary at Minnesota/Iowa border	SW SE	34	101N	18W	0.48	0.0	0.7	0.48	0.0	0.7	0.89	26.2
4801400	Unnamed tributary at Minnesota/Iowa border	SE SW	32	101N	16W	6.16	0.0	0.1	6.16	0.0	0.1	6.23	11.0
4806400	Unnamed tributary at Minnesota/Iowa border	SW SE	32	101N	16W	1.74	0.0	0.1	1.74	0.0	0.1	2.99	24.8
4806500	Unnamed tributary to Little Cedar River at Minnesota/ Iowa border	SE NW	09	100N	16W	3.87	0.0	3.4	3.87	0.0	3.4	3.63	25.8
4901400	County Ditch No. 9 above basin 4901500	NW SE	27	103N	22W	15.9	1.1	3.9	15.9	1.1	3.9	7.04	8.1
4901500	County Ditch No. 9 above County Ditch No. 11	SE SE	26	103N	22W	10.4	0.0	0.1	26.3	0.7	2.4	8.60	7.0
4901301	Unnamed stream extension above gaging station near School Section Lake: station number is 05458960	SW SE	25	103N	22W	0.14	0.0	0.0	0.14	0.0	0.0	0.57	62.4
4901300	Unnamed tributary above Fountain Lake	NE NW	06	102N	21W	8.16	0.0	4.1	34.6	0.5	2.8	11.5	6.9
4901600	Unnamed tributary above Fountain Lake	SW NW	08	102N	21W	15.2	5.6	11.3	17.7	4.8	9.9	8.12	6.6
4900100	Bancroft Creek above unnamed tributary basin 4900200	NE NW	16	103N	21W	15.9	0.0	0.6	15.9	0.0	0.6	7.53	7.2

Table 1.—Physical characteristic data for the Upper Wapsipinicon, Upper Cedar, Shell Rock, and Winnebago River Basins—Continued

Basin number	Stream name and location	Outlet location				By subbasin			Cumulative to mouth of basin				
		Quarter-quarter section	Section	Township	Range	Drainage area (square miles)	Lake area (percent of subbasin area)	Storage area (percent of subbasin area)	Drainage area (square miles)	Lake area (percent of total area)	Storage area (percent of total area)	Main channel length (miles)	Main channel slope (foot per mile)
	First Rank / Second Rank / Third Rank / Fourth Rank / Fifth Rank												
4900200	Unnamed tributary above Bancroft Creek	NE NW	16	103N	21W	7.18	0.0	0.2	7.18	0.0	0.2	4.63	14.5
4901201	Bancroft Creek above gaging station at Bancroft: station is 05458950	SW SE	21	103N	21W	5.50	0.0	0.8	28.6	0.0	0.5	9.73	6.4
4901200	Fountain Lake (Bancroft Creek) above Fountain Lake	SW SE	05	102N	21W	14.4	2.4	9.1	42.9	0.8	3.4	13.2	5.2
4900400	County Ditch No. 32 above Peter Lund Creek	NE NW	17	102N	20W	10.4	0.0	0.1	10.4	0.0	0.1	6.22	5.1
4900500	Peter Lund Creek above Albert Lea Lake	SE SE	07	102N	20W	17.9	0.0	0.2	28.3	0.0	0.2	9.58	3.1
4900300	Albert Lea Lake above Shell Rock River	NE NE	25	102N	21W	25.1	20.1	22.9	148.	4.3	6.7	19.0	4.6
4900600	Judicial Ditch No. 20 above Shell Rock River	NE SW	08	101N	20W	8.35	0.0	1.8	8.35	0.0	1.8	26.6	2.8
4900700	Shell Rock River above County Ditch No. 16	NE SE	18	101N	20W	13.6	0.3	5.6	170.	3.8	6.4	26.6	2.8
4900800	County Ditch No. 16 above Shell Rock River	NE SE	18	101N	20W	15.8	0.0	0.6	15.8	0.0	0.6	8.41	2.4
4900901	Shell Rock River above Goose Creek (County Ditch No. 10)	SE SE	31	101N	20W	8.73	0.0	4.4	195.	3.3	5.8	31.1	2.1
4901801	County Ditch No. 46 above County Ditch No. 17	NW SE	34	101N	21W	7.96	0.0	0.0	7.96	0.0	0.0	6.93	10.0
4901800	County Ditch No. 17 above Goose Creek (County Ditch No. 10)	NW NE	35	101N	21W	12.1	4.0	9.1	20.0	2.4	5.5	9.08	8.6
4901700	County Ditch No. 40 above Goose Creek (County Ditch No. 10)	SE NW	36	101N	21W	9.85	0.0	1.4	9.85	0.0	1.4	9.93	5.2
4901100	Goose Creek (County Ditch No. 10) above Shell Rock River	SE SE	31	101N	20W	27.6	2.1	11.7	57.5	1.9	7.8	17.4	4.7
4900900	Shell Rock River at Minnesota/Iowa border	SW SW	32	101N	20W	0.11	0.0	22.7	252.	3.0	6.3	31.4	2.1
4901000	Unnamed tributary at Minnesota/Iowa border	SW SE	33	101N	20W	2.06	0.0	0.8	2.06	0.0	0.8	3.29	18.1

Table 1.—Physical characteristic data for the Upper Wapsipinicon, Upper Cedar, Shell Rock, and Winnebago River Basins—Continued

Basin number	Stream name and location	Outlet location				By subbasin			Cumulative to mouth of basin				
		Quarter-quarter section	Section	Township	Range	Drainage area (square miles)	Lake area (percent of subbasin area)	Storage area (percent of subbasin area)	Drainage area (square miles)	Lake area (percent of total area)	Storage area (percent of total area)	Main channel length (miles)	Main channel slope (foot per mile)
	First Rank / Second Rank / Third Rank / Fourth Rank / Fifth Rank												
5000100	Steward Creek (County Ditch No. 23) above Bear Lake	SE NE	18	101N	22W	20.1	0.0	0.2	20.1	0.0	0.2	11.2	4.4
5000300	Unnamed tributary above Bear Lake	NE SW	08	101N	22W	9.39	0.0	4.3	9.39	0.0	4.3	6.02	7.5
5000200	Lime Creek above unnamed tributary basin 5000400	NE SE	35	101N	23W	24.8	4.4	15.7	54.3	2.0	8.0	17.2	2.6
5000400	Unnamed tributary above Lime Creek	NE SE	35	101N	23W	14.1	0.0	0.6	14.1	0.0	0.6	8.67	10.5
5000600	Lime Creek at Minnesota/Iowa border	SW SE	35	101N	23W	0.40	0.0	0.0	68.7	1.6	6.5	17.9	2.6
5000500	Judicial Ditch No. 26 at Minnesota/Iowa border	SE SE	33	101N	23W	7.93	0.0	0.6	7.93	0.0	0.6	5.95	4.6