

1970

WISCONSIN DEPARTMENT OF NATURAL RESOURCES

BASE-FLOW STUDY OF
EAST RIVER BASIN
BROWN AND CALUMET
COUNTIES, WISCONSIN

by

Robert W. Devaul

U. S. Geological Survey

Prepared by
United States Geological Survey
in cooperation with the
Wisconsin Department of Natural Resources

Madison, Wisconsin

OFR

East River Copy #3



United States Department of the Interior

GEOLOGICAL SURVEY
Water Resources Division
1815 University Avenue
Madison, Wisconsin - 53706
June 22, 1970

Mr. John O'Donnell
Wisconsin Department of Natural Resources
P. O. Box 450
Madison, Wisconsin - 53701

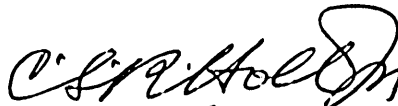
Dear Mr. O'Donnell:

Attached is the information collected as a result of the base-flow study of the East River basin, Brown and Calumet Counties, Wisconsin, in August 1969. This study was conducted by the U.S. Geological Survey in cooperation with the Wisconsin Department of Natural Resources.

Figure 2 is a map showing the locations of all stream measuring sites. Table 1 contains the streamflow information collected during the periods indicated; table 2 lists dissolved oxygen measurements. The additional tables were compiled from information already available from the files of the U.S. Geological Survey.

The streamflow at four continuous-record gaging sites in and near the Green Bay area (figure 1) indicated the discharge in the area to be at about the 50 to 55 percent duration point (table 2) during the first set of August measurements and at about the 70 to 80 percent duration point during the second set of August measurements. That is, about 55 and 80 percent of the time respectively, the discharge of these streams would exceed that which occurred on these dates. A representative summer base flow is considered to be on the order of 80 percent duration.

Very truly yours,


C. L. R. Holt, Jr.
District Chief

CLH/paz

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Streams in the East River basin gain ground water throughout most of their reaches, however, ground-water pumping of the Green Bay - DePere area may reduce the water being gained by the streams from ground water. The August 13, 14 measurements were made during base-flow period when flow duration was about 50 to 55 percent (table 2). The August 28 measurements were made during a lower base-flow period when flow duration was about 70 to 80 percent. About 80 percent duration is more representative of low-flow conditions during the summer.

On August 13, 14, the sub-basins contributed ground water ranging from 0 to .037 cfs per sq mi. On August 28, discharges in cfs per square mile were much less. Backwater at site 9 prevented measurement. The sub-basins contributing very small discharges are in the upper reaches of the stream, which may become intermittent during dry periods.

Water temperatures during August 13, 14, and 28 ranged from 21.7°C (71°F) to 27.8°C (82°F). No temperature correlations were made because water temperatures were taken at different times during the day.

Specific conductance of water, measured in micromhos at 25°C, indicates the amount of dissolved minerals in the water. The specific conductance measured for the East River basin area ranged from 525 to 1200 micromhos.

Dissolved oxygen measurements were made at least once at each site (except site 9) during the study. The values obtained indicated that at several sites the water was supersaturated. It would, however, be more useful to obtain a 24-hour dissolved oxygen profile at several points within the basin.

Table No. 1.--Low-flow and related water quality measurements in the East River basin, Brown and Calumet Counties, Wisconsin.

Stream	Site No.	Drainage area above site (sq mi)	August 13, 14, 1989							August 28, 1989						
			Discharge		Mean vel. (ft/sec)	Spec. cond. (micro-mhos)	Temperature (°F)		Time CDT	Discharge		Mean vel. (ft/sec)	Spec. cond. (micro-mhos)	Temperature (°F)		Time CDT
			cfs	cfs/m ²			Air	Water		cfs	cfs/m ²			Air	Water	
East River	1	20.2	.89	.044	.76	625	70	71	0900	.18	.008	.44	650	85	81	1615
Tributary	2	3.3	No flow			525	75	74	0920	No flow		-	-	-	-	-
Tributary	3	11.6	.50	.043	1.13	770	75	71	0950	.17	.015	.85	925	85	73	1650
East River	4	37.5	1.25	.033	1.14	700	75	73	1030	.37	.010	.76	680	80	78	1730
East River	5	51.1	1.74	.034	1.74	690	78	75	1120	.27	.005	.83	690	80	78	1805
East River (sta. 04-0851.1)	6	58.4	2.17	.037	.54	680	80	78	1300	.53	.009	.14	-	88	75	1605
East River	7	65.1	2.19	.034	.31	700	83	74	1320	.41	.006	.18	690	78	71	1000
Bower Creek	8	34.3	.02	.001	.11	740	80	82	1620	No flow -		-	-	-	-	-
East River	9	Backwater - No measurable section														
Baird Creek	10	23.8	.39	.016	.37	1200	80	77	1835	.08	.003	.10	-	82	-	1110
Miscellaneous measurement																
East River (sta. 04-0851.1)	6	58.4	.60	.010	.12	725	-	48	0950	October 4, 1988						

Table 2.--Discharge and flow duration of four long-term continuous record gaging stations and two long-term partial record sites in the Green Bay area on indicated dates. Includes 7-day Q_2 and 7-day Q_{10} values*.

Stream	Drainage area (sq mi)	Date	Discharge		Flow duration % of time flow equaled or exceeded	7-day	
			cfs (ave. daily)	cfs/sq mi		Q_2 (cfs) ^a	Q_{10} (cfs) ^b
Wolf River at Keshena Falls	812	8/11/69	584	.72	57.0	380	300
		8/12/69	597	.74	54.9		
		8/13/69	595	.73	55.2		
		8/26/69	472	.58	78.3		
		8/27/69	472	.58	78.3		
		8/24/69	473	.58	78.1		
Embarrass River near Embarrass	395	8/11/69	194	.49	44.8	75	45
		8/12/69	180	.46	48.7		
		8/13/69	168	.43	53.6		
		8/26/69	126	.32	70.8		
		8/27/69	126	.32	70.8		
		8/28/69	125	.32	71.4		
Wolf River at new London	2,240	8/11/69	1,180	.53	51.8	655	450
		8/12/69	1,140	.51	54.3		
		8/13/69	1,140	.51	54.3		
		8/26/69	824	.37	78.0		
		8/27/69	824	.37	78.0		
		8/28/69	824	.37	78.0		
Oconto River near Gillette	678	8/11/69	406	.60	54.0	230	175
		8/12/69	411	.61	53.1		
		8/13/69	397	.59	55.8		
		8/26/69	300 ^e	.44	78.2		
		8/27/69	290 ^e	.43	80.7		
		8/28/69	285 ^e	.42	82.4		
North Branch Embarrass River near Bowler	37.1	8/11/69	25.3 ^m	.68	-	9.2 ^c	5.6 ^c
		8/27/69	23.1 ^m	.62	-		
Apple Creek near Kaukauna	14.6	8/12/69	0 ^m	0	-	0	0
		8/26/69	0 ^m	0	-		

* ^a 7-day Q_2 - The lowest mean discharge for 7 consecutive days that occurs on the average of once in 2 years or has a 50 percent chance of occurring in any year.

^b 7-day Q_{10} - The lowest mean discharge for 7 consecutive days that occurs on the average of once in 10 years or has a 10 percent chance of occurring in any year.

^c - Values obtained by correlation with nearby long-term gaging stations.

^m - Measured discharge. ^e - Estimated.

Table No. 3.--Dissolved oxygen measurements made during period of low-flow investigations in the East River basin, Wisconsin.

Stream	Site No.	Date	Dissolved Oxygen			
			Time CDT	Temp °C	mg/l	Percent Sat.
East River	1	Aug. 18, 1969	1725	27.3	9.4 ^a	124
		Aug. 28, 1969	1630	27.2	9.5 ^b	123
Tributary	2	Aug. 8, 1969	1725	27.7	8.5	112
Tributary	3	Aug. 18, 1969	1745	22.7	6.2 ^a	75
East River	4	Aug. 18, 1969	1700	27.7	7.2 ^a	95
East River	5	Aug. 18, 1969	1625	25.6	14.3 ^a	181
East River	6	Aug. 18, 1969	1610	25.6	8.3 ^a	105
East River	7	Aug. 18, 1969	1520	26.2	7.0 ^a	90
Bower Creek	8	Aug. 18, 1969	1505	27.9	8.6 ^a	113
Baird Creek	10	Aug. 18, 1969	1415	26.5	9.7 ^a	124
		Aug. 28, 1969	1110	-	10.0 ^b	-

^a - D. O. determination by D. O. meter.

^b - D. O. determination by field kit.