1970

OFR Suamico River Copy #3

WISCONSIN DEPARTMENT OF NATURAL RESOURCES

BASE-FLOW STUDY OF SUAMICO RIVER BASIN, OCONTO, BROWN, SHAWANO AND OUTAGAMIE 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

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 Suamico River basin, Oconto, Brown, Shawano, and Outagamie 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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The Suamico River is a gaining stream throughout its entire reach. No loss of water from the streams was noted between any measuring sites. The August 12 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. Flow duration at about 80 percent is more representative of low-flow conditions during the summer.

On August 12, most of the sub-basins contributed ground water ranging from 0 to .125 cfs per sq mi. There was no discharge at site 2 during either measurement period. On August 28, discharge in cfs per sq mi was considerably less than on August 12. 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 12 and 28 ranged from 19.4°C (67°F) to 26.1°C (79°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 Suamico River ranged from 305 to 630 micromhos. None of the values obtained appeared abnormal for the area.

Dissolved oxygen measurements were made at least once at each site during the study (table 3). The readings indicated that when measured, the water was supersaturated at each site. However, it would 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 Suamico River basin, Oconto, Brown, Shawano and Outagamie Counties, Wisconsin.

Stream	Site No.	Drainage area above site (sq mi)	August 12, 1969							August 28, 1969						
			Discharge		Mean vel. (ft/sec)	Spec. cond. (micromhos)	Temperature (°F)		Time CDT	Discharge		Mean vel. (ft/sec)	Spec. cond. (micromhos)	Temperature (°F)		Time CDT
			cfs	cfs/m^2			Air	Water		cfs	cfs/m^2			Air	Water	
Suamico River	1	10.5	.22	.021	.14	555	84	78	1300	0.12	.011	0.42	540	84	79	1700
Tributary	2	12.0	No flow	-	-	-	-	-	-	No flow	-	-	-	-	-	-
Tributary	3	10.8	.74	.069	.49	600	84	76	1530	.16	.015	.34	630	87	76	1540
Tributary	4	5.6	.70	.125	.67	500	80	70	1620	.55	.098	.65	520	82	67	1410
Suamico River (sta. 04-0720)	5	57.0	3.38	.059	.34	420	80	81	1755	2.53*	.044	.52	410	75	80	1400
Tributary	6	7.8	.24	.031	.19	305	78	67	1030	.04	.005	.35	360	78	76	1230

* - Measurement made August 26, 1969.

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 cfs (ave. daily)	Discharge cfs/sq mi	Flow duration % of time flow equaled or exceeded	7-day Q_2 (cfs)[a]	7-day 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	300e	.44	78.2		
		8/27/69	290e	.43	80.7		
		8/28/69	285e	.42	82.4		
North Branch Embarrass River near Bowler	37.1	8/11/69	25.3m	.68	-	9.2c	5.6c
		8/27/69	23.1m	.62	-		
Apple Creek near Kaukauna	14.6	8/12/69	0m	0	-	0	0
		8/26/69	0m	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 Suamico River basin, Wisconsin.

Stream	Site No.	Date	Dissolved Oxygen			
			Time CDT	Temp °C	mg/l	Percent Sat.
Suamico River	1	Aug. 15, 1969	1215	23.0	12.4[a]	142
		Aug. 28, 1969	1700	26.1	12 [b]	146
Tributary	2	Aug. 15, 1969	No flow		-	-
		Aug. 28, 1969	No flow		-	-
Tributary	3	Aug. 15, 1969	1200	24.2	9.4[a]	112
Tributary	4	Aug. 15, 1969	1150	16.4	10.8[a]	110
		Aug. 28, 1969	1410	19.4	9.5[b]	102
Suamico River	5	Aug. 15, 1969	1120	26.0	10.2[a]	124
Tributary	6	Aug. 15, 1969	1045	18.0	9.8[a]	103

a - D. O. determinations by D. O. meter.
b - D. O. determinations by field kit.