

# Water Resources Data for Michigan

U.S. GEOLOGICAL SURVEY WATER-DATA REPORT MI-78-1

## WATER YEAR 1978

Prepared in cooperation with the State of  
Michigan and with other agencies



# CALENDAR FOR WATER YEAR 1978

1 9 7 7

## OCTOBER

S	M	T	W	T	F	S
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31					

## NOVEMBER

S	M	T	W	T	F	S
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30			

## DECEMBER

S	M	T	W	T	F	S
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

1 9 7 8

## JANUARY

S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

## FEBRUARY

S	M	T	W	T	F	S
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28				

## MARCH

S	M	T	W	T	F	S
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

## APRIL

S	M	T	W	T	F	S
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30						

## MAY

S	M	T	W	T	F	S
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

## JUNE

S	M	T	W	T	F	S
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	

## JULY

S	M	T	W	T	F	S
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31					

## AUGUST

S	M	T	W	T	F	S
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

## SEPTEMBER

S	M	T	W	T	F	S
						1
						2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30





# Water Resources Data for Michigan

U.S. GEOLOGICAL SURVEY WATER-DATA REPORT MI-78-1

## WATER YEAR 1978

Prepared in cooperation with the State of  
Michigan and with other agencies



UNITED STATES DEPARTMENT OF THE INTERIOR

Cecil D. Andrus, Secretary

GEOLOGICAL SURVEY

H. W. Menard, Director

For information on the water program in Michigan write to  
District Chief, Water Resources Division  
U.S. Geological Survey  
6520 Mercantile Way, Suite 5  
Lansing, Michigan 48910

1979



## PREFACE

This report was prepared by personnel of the Michigan district of the Water Resources Division of the U.S. Geological Survey under the supervision of T. R. Cummings, District Chief, and J. E. Biesecker, Regional Hydrologist, Northeastern Region, It was done in cooperation with other agencies.

This report is one of a series issued by State. General direction for the series is by J. S. Cragwall, Jr., Chief Hydrologist, U.S. Geological Survey, and Phil H. Cohen, Assistant Chief Hydrologist for Scientific Publications and Data Managment.







## CONTENTS

---

	Page
Preface.....	III
List of gaging stations, in downstream order, for which records are published.....	VI
List of counties for which records of ground-water levels are published.....	X
Introduction.....	1
Cooperation.....	1
Acknowledgments.....	2
Hydrologic conditions.....	2
Definition of terms.....	2
Downstream order and station numbers.....	8
Numbering system for wells.....	8
Special networks and programs.....	9
Explanation of stage and water-discharge records.....	10
Collection and computation of data.....	10
Accuracy of data.....	12
Other data available.....	12
Explanation of water-quality records.....	12
Collection and examination of data.....	12
Water analysis.....	12
Water temperature.....	13
Sediment.....	13
Explanation of ground-water level records.....	13
Collection of the data.....	13
Publications on techniques of water-resources investigations.....	14
Gaging station records.....	20
Discharge at partial-record stations and miscellaneous sites.....	399
Low-flow partial-record stations.....	399
Crest-stage partial-record stations.....	401
Miscellaneous sites.....	408
Analyses of samples collected at miscellaneous sites.....	412
Ground-water records.....	427
Ground-water level records.....	427
Temperature of ground-water.....	442
Index.....	445

## ILLUSTRATIONS

---

Figure 1. Comparison of discharge at three long-term representative gaging stations during 1978 water year with mean discharge for period 1941-70.....	3
2. System for numbering wells (latitude and longitude).....	8
3. Well numbering system in Michigan.....	9
4. Map showing identification number and location of gaging stations in Upper Peninsula of Michigan.....	16
5. Map showing identification number and location of gaging stations in Lower Peninsula of Michigan.....	17
6. Map showing identification number and location of water-quality stations in Upper Peninsula of Michigan.....	18
7. Map showing identification number and location of water-quality stations in Lower Peninsula of Michigan.....	19
8. Location of water-quality temperature recorders and surface-water gaging sites in and around the Greenwood Reservoir complex.....	76
9. Map showing location of observation wells published in this report.....	426



[Letter after station name designates type of data: (d) discharge, (c) chemical, (b) biological, (g) gage height, (m) microbiological, (t) water temperature, (s) sediment]

	Page
<b>ST. LAWRENCE RIVER BASIN</b>	
<b>STREAMS TRIBUTARY TO LAKE SUPERIOR</b>	
Washington Creek at Windigo (dcmts).....	20
Black River near Bessemer (d).....	24
Presque Isle River at Marenisco (d).....	25
Middle Branch Ontonagon River near Paulding (d).....	26
Bond Falls Reservoir:	
Bond Falls Canal near Paulding (d).....	27
Bond Falls Reservoir near Paulding (dg).....	28
Middle Branch Ontonagon River near Trout Creek (d).....	29
East Branch Ontonagon River near Mass (d).....	30
Middle Branch Ontonagon River near Rockland (d).....	31
West Branch Ontonagon River near Bergland (d).....	32
South Branch Ontonagon River:	
Cisco Branch Ontonagon River at Cisco Lake Outlet (d).....	33
Ontonagon River near Rockland (dcmts).....	34
Portage River (Portage Lake):	
Sturgeon River near Sidnaw (d).....	39
Sturgeon River near Alston (d).....	40
Sturgeon River near Chassell (cbmts).....	41
Trap Rock River near Lake Linden (dt).....	45
Carp River near Negaunee (d).....	48
Tahquamenon River near Tahquamenon Paradise (dcmts).....	49
<b>STREAMS TRIBUTARY TO ST. MARYS RIVER</b>	
St. Marys River above Sault Ste. Marie (cbmt).....	57
<b>STREAMS TRIBUTARY TO LAKE MICHIGAN</b>	
Black River near Garnet (dt).....	62
Manistique River near Manistique (d).....	65
Manistique River above Manistique (cbmts).....	66
Sturgeon River near Nahma Junction (d).....	72
Middle Branch Escanaba River at Humboldt (dt).....	73
Greenwood Reservoir near Greenwood (d).....	77
Greenwood Afterbay near Greenwood (t).....	78
Greenwood Diversion near Greenwood (dt).....	80
Greenwood Release (Middle Branch Escanaba River) near Greenwood (dt).....	83
Middle Branch Escanaba River near Greenwood (dct).....	86
Middle Branch Escanaba River near Ishpeming (t).....	89
Middle Branch Escanaba River near Princeton (dc).....	91
Green Creek near Palmer (c).....	93
Green Creek near Princeton (dt).....	94
Schweitzer Creek (head of East Branch Escanaba River):	
Schweitzer Reservoir near Palmer (d).....	97
Schweitzer Creek near Palmer (d).....	98
Warner Creek Tributary near Palmer (c).....	99
Warner Creek near Palmer (d).....	100
Goose Lake Outlet near Sands Station (dt).....	101
East Branch Escanaba River at Gwinn (dc).....	104
Escanaba River at Cornell (dcmts).....	106
Ford River:	
Ford River near Hyde (dcmts).....	113
Brule River (head of Menominee River):	
Iron River at Caspian (d).....	120
Brule River near Florence, WI (d).....	121
Paint River at Crystal Falls (d).....	122
Paint River near Alpha (d).....	123
Peshekee River near Champion (dt).....	124
Michigamme River near Michigamme (dc).....	127
Michigamme River near Witch Lake (dc).....	129
Michigamme River near Crystal Falls (d).....	131
Menominee River near Florence, WI (d).....	132
Sturgeon River:	
West Branch Sturgeon River near Randville (d).....	133
East Branch Sturgeon River below Skunk Creek near Felch (d).....	134
East Branch Sturgeon River at Hardwood (dt).....	135
Sturgeon River near Foster City (dt).....	138
Pine Creek near Iron Mountain (dt).....	141
Menominee River near Pembine, WI (d).....	144
Menominee River below Koss (d).....	145
Menominee River near McAllister, WI (cbmts).....	146
St. Joseph River:	
Beebe Creek near Hillsdale (d).....	149
St. Joseph River near Burlington (d).....	150
Coldwater River:	
Hog Creek near Allen (d).....	151
Coldwater River near Hodunk (d).....	152
Nottawa Creek near Athens (d).....	153
Portage River near Vicksburg (d).....	154

ST. LAWRENCE RIVER BASIN--ContinuedSTREAMS TRIBUTARY TO LAKE MICHIGAN--Continued

St. Joseph River at Three Rivers (d).....	155
Prairie River near Nottawa (d).....	156
Crooked Creek (head of Fawn River):	
Lime Lake Outlet at Panama, IN (d).....	157
St. Joseph River at Mottville (d).....	158
Pigeon River near Scott, IN (d).....	159
North Branch Elkhart River at Cosperville, IN (d).....	160
Elkhart River at Goshen, IN (d).....	161
St. Joseph River at Elkhart, IN (d).....	162
St. Joseph River at Niles (d).....	163
Dowagiac River at Summerville (d).....	164
Paw Paw River at Riverside (d).....	165
Black River near Bangor (d).....	166
Kalamazoo River at Marshall (d).....	167
Battle Creek at Battle Creek (d).....	168
Kalamazoo River near Battle Creek (d).....	169
Augusta Creek near Augusta (d).....	170
Kalamazoo River at Comstock (d).....	171
Portage Creek near Kalamazoo (d).....	172
West Fork Portage Creek near Oshtemo (d).....	173
West Fork Portage Creek at Kalamazoo (d).....	174
Portage Creek at Kalamazoo (dt).....	175
Kalamazoo River near Fennville (d).....	178
Rabbit River near Hopkins (d).....	179
Kalamazoo River at Saugatuck (cbmts).....	180
Black River near Zeeland (d).....	187
Grand River at Jackson (d).....	188
Grand River near Eaton Rapids (d).....	189
Red Cedar River near Williamston (d).....	190
Deer Creek near Dansville (d).....	191
Sloan Creek near Williamston (d).....	192
Red Cedar River at East Lansing (d).....	193
Sycamore Creek near Holt (d).....	194
Grand River at Lansing (d).....	195
Carrier Creek near Lansing (d).....	196
Grand River at Portland (d).....	197
Looking Glass River near Eagle (d).....	198
Maple River at Maple Rapids (d).....	199
Grand River at Ionia (d).....	200
Flat River at Smyrna (d).....	201
Thornapple River near Hastings (d).....	202
Thornapple River near Caledonia (d).....	203
Rogue River near Rockford (d).....	204
Grand River at Grand Rapids (d).....	205
Muskegon River:	
Clam River at Vogel Center (d).....	206
Muskegon River at Evart (dt).....	207
Little Muskegon River near Morley (dt).....	210
Muskegon River at Newaygo (d).....	213
Muskegon River near Bridgeton (cbmts).....	214
Bear Creek near Muskegon (d).....	220
White River near Whitehall (d).....	221
Pere Marquette River at Scottville (dt).....	222
Manistee River near Sherman (d).....	225
Pine River near Hoxeyville (d).....	226
Manistee River near Manistee (d).....	227
Manistee River at Manistee (cbmts).....	228
Boardman River near Mayfield (d).....	235
Jordan River near East Jordan (dt).....	236
STREAMS TRIBUTARY TO LAKE HURON	
Pine River near Rudyard (d).....	239
Burt Lake (head of Cheboygan River):	
Sturgeon River near Wolverine (dt).....	240
Indian River (outlet of Burt Lake) at Indian River (d).....	243
Pigeon River near Vanderbilt (d).....	244
Pigeon River at Afton (d).....	245
Cheboygan River (continuation of Indian River) near Cheboygan (d).....	246
Black River near Tower (d).....	247
Rainy River near Ocqueoc (d).....	248
Cheboygan River at Cheboygan (cbmts).....	249
Thunder Bay River near Bolton (d).....	256
North Branch Thunder Bay River near Bolton (d).....	257



	Page
ST. LAWRENCE RIVER BASIN--Continued	
STREAMS TRIBUTARY TO LAKE HURON--Continued	
Au Sable River at Grayling (dt).....	258
East Branch Au Sable River at Grayling (d).....	261
South Branch Au Sable River near Luzerne (dt).....	262
Au Sable River at Mio (d).....	265
Au Sable River near Au Sable (cbmts).....	266
Au Gres River near National City (d).....	270
Rifle River at Selkirk (d).....	271
Shepards Creek:	
South Branch Shepards Creek near Selkirk (d).....	272
Rifle River near Sterling (dcbmts).....	273
Kawkawlin River:	
North Branch Kawkawlin River near Kawkawlin (d).....	280
Shiawassee River (head of Saginaw River) at Linden (d).....	281
Shiawassee River at Byron (dt).....	282
Shiawassee River at Owosso (d).....	285
Shiawassee River near Fergus (d).....	286
Flint River:	
South Branch Flint River:	
Farmers Creek near Lapeer (d).....	287
Flint River:	
Holloway Reservoir near Otisville (d).....	288
Flint River near Otisville (d).....	289
Butternut Creek near Genesee (d).....	290
Kearsley Creek near Davison (d).....	291
Gilkey Creek near Flint (d).....	292
Swartz Creek at Flint (d).....	293
Thread Creek near Flint (d).....	294
Flint River near Flint (d).....	295
Brent Run near Montrose (d).....	296
Flint River near Fosters (d).....	297
Flint River near Alicia (g).....	298
South Branch Cass River near Cass City (d).....	299
Cass River at Cass City (d).....	300
Cass River at Wahjamega (d).....	301
Cass River at Frankemuth (d).....	302
Tittabawassee River:	
Tobacco River at Beaverton (d).....	303
Chippewa River near Mount Pleasant (d).....	304
Pine River at Alma (d).....	305
Pine River near Midland (d).....	306
Tittabawassee River at Midland (d).....	307
Saginaw River at Saginaw (dcbmts).....	308
Pigeon River near Owendale (d).....	315
Pigeon River near Caseville (cbmts).....	316
STREAMS TRIBUTARY TO ST. CLAIR RIVER	
St. Clair River at Port Huron (cbmts).....	320
Black River:	
Silver Creek near Jeddo (d).....	324
Black River near Fargo (d).....	325
Belle River:	
North Branch Belle River at Imlay City (d).....	326
Belle River at Memphis (d).....	327
STREAMS TRIBUTARY TO LAKE ST. CLAIR	
Clinton River:	
Sashabaw Creek near Drayton Plains (d).....	328
Clinton River near Drayton Plains (d).....	329
Clinton River at Auburn Heights (d).....	330
Galloway Creek near Auburn Heights (d).....	331
Paint Creek at Rochester (d).....	332
Stony Creek near Romeo (d).....	333
Stony Lake near Washington (d).....	334
Stony Creek near Washington (d).....	335
Red Run:	
Big Beaver Creek near Warren (d).....	336
Plum Brook at Utica (d).....	337
Clinton River near Fraser (d).....	338
North Branch Clinton River:	
East Pond Creek at Romeo (d).....	339
Coon Creek:	
East Branch Coon Creek at Armada (d).....	340
North Branch Clinton River near Mount Clemens (d).....	341
Middle Branch Clinton River at Macomb (d).....	342
Clinton River at Mount Clemens (dcbmts).....	343

GAGING STATIONS, IN DOWNSTREAM ORDER, FOR WHICH RECORDS ARE PUBLISHED--Continued

IX

Page

ST. LAWRENCE RIVER BASIN--Continued

STREAMS TRIBUTARY TO DETROIT RIVER

Detroit River at Detroit (cbmt).....	351
River Rouge at Birmingham (d).....	355
River Rouge at Southfield (d).....	356
Evans Ditch at Southfield (d).....	357
Upper River Rouge at Farmington (d).....	358
River Rouge at Detroit (d).....	359
Lower River Rouge at Inkster (d).....	360

STREAMS TRIBUTARY TO LAKE ERIE

Huron River at Milford (d).....	361
Huron River near New Hudson (d).....	362
Huron River near Hamburg (d).....	363
Huron River near Dexter (cb).....	364
Mill Creek near Lima Center (cb).....	366
North Fork Mill Creek near Chelsea (cb).....	368
North Fork Mill Creek near Lima Center (cb).....	370
Mill Creek near Dexter (d).....	372
Huron River at Delhi Mills (cb).....	373
Huron River at Ann Arbor (d).....	376
Huron River at Ypsilanti (dcb).....	377
Ford Lake near Rawsonville (cb).....	380
Stony Creek at Oakville (d).....	382
River Raisin near Sharonville (cb).....	383
River Raisin near Manchester (d).....	385
River Raisin at Manchester (cb).....	386
River Raisin near Tecumseh (d).....	388
River Raisin near Adrian (d).....	389
Saline River above Saline (cb).....	390
Saline River above Milan (cb).....	392
River Raisin near Monroe (dcbmts).....	394



## LIST OF COUNTIES FOR WHICH RECORDS OF GROUND-WATER LEVELS ARE PUBLISHED

	Page
Alger County .....	427
Alpena County.....	427
Baraga County.....	427
Barry County.....	428
Bay County.....	428
Branch County.....	428
Calhoun County.....	429
Cass County.....	429
Cheboygan County.....	430
Chippewa County.....	430
Clinton County.....	430
Crawford County....	431
Delta County.....	431
Dickinson County.....	431
Eaton County.....	432
Genesee County.....	432
Gogebic County.....	432
Grand Traverse County.....	433
Hillsdale County.....	433
Ingham County.....	433
Iron County.....	434
Jackson County.....	434
Kalamazoo County.....	434
Kent County.....	435
Lenawee County.....	436
Livingston County.....	436
Mackinac County.....	436
Marquette County.....	437
Menominee County.....	437
Monroe County.....	437
Muskegon County.....	438
Oakland County.....	438
Oceana County.....	438
Ogemaw County.....	439
Ontonagon County.....	439
Presque Isle County.....	439
Roscommon County.....	440
Sanilac County.....	440
Schoolcraft County.....	440
Van Buren County.....	441
Washtenaw County.....	441
Wexford County.....	441

## INTRODUCTION

Water resources data for the 1978 water year for Michigan consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels and water temperature of ground-water wells. This volume contains records for water discharge at 187 gaging stations; stage only at 1 gaging station; stage and contents at 5 lakes and reservoirs; water quality at 65 gaging stations (including 6 lakes); and water levels at 45 observations wells. Locations of these sites are shown on figures 4-9. Also included are data for 93 crest-stage partial-record stations and 18 low-flow partial-record stations. Additional water data were collected at various sites not involved in the systematic data-collection program and are published as miscellaneous measurements and analyses. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State, local, and Federal agencies in Michigan.

Records of discharge and stage of streams, and contents or stage of lakes and reservoirs were first published in a series of U.S. Geological Survey water-supply papers entitled, "Surface Water Supply of the United States." Through September 30, 1960, these water-supply papers were in an annual series and then in a 5-year series for 1961-65 and 1966-70. Records of chemical quality, water temperatures, and suspended sediment were published from 1941 to 1970 in an annual series of water-supply papers entitled, "Quality of Surface Waters of the United States." Records of ground-water levels were published from 1935 to 1974 in a series of water-supply papers entitled, "Ground Water Levels in the United States." Water-supply papers may be consulted in the libraries of the principal cities in the United States or may be purchased from Branch of Distribution, U.S. Geological Survey, 1200 South Eads Street, Arlington, VA 22202.

For water years 1961 through 1974, streamflow data were released by the Geological Survey in annual reports on a State-boundary basis. Water-quality records for water years 1964 through 1974 were similarly released either in separate reports or in conjunction with streamflow records. Ground-water records beginning with the 1956 calendar year and continuing through calendar year 1975 have been released by the Geological Survey in annual reports on a State-boundary basis.

Beginning with the 1975 water year, water data for streamflow, water quality, and ground water are published in official Survey reports on a State-boundary basis. These official Survey reports carry an identification number consisting of the two-letter State abbreviation, the last two digits of the water year, and the volume number. For example, this volume is identified as "U.S. Geological Survey Water-Data Report MI-78-1." For archiving and general distribution, the reports for water years 1971-74 are also identified as water-data reports. These water-data reports are for sale in paper copy or in microfiche by the National Technical Information Service, U.S. Department of Commerce, Springfield, VA 22161.

Additional information, including current prices, for ordering specific reports may be obtained from the district chief at the address given on the back of the title page or by telephone (517) 372-1910, X561.

## COOPERATION

The U.S. Geological Survey and organizations of the State of Michigan have had cooperative agreements for the systematic collection of streamflow records since 1930, for ground-water levels since 1932, and for water-quality records since 1951. Organizations that assisted in collecting data through cooperative agreement with the Survey are:

State Department of Natural Resources, H.A. Tanner, director, through Water Management Division, D.W. Granger, chief, succeeded by L.N. Witte, and Geological Survey Division, A.E. Slaughter, chief.

State Department of State Highways, J.P. Woodford, director.

Assistance in the form of funds or services was given by the Corps of Engineers, U.S. Army, in collecting records for 29 gaging stations published in this report. Assistance was also furnished by the National Weather Service, National Oceanic Atmospheric Administration, U.S. Department of Commerce, Soil Conservation Service, U.S. Department of Agriculture, Environmental Protection Agency, and the National Park Service.

The following organizations aided in collecting records:

Dickinson County Road Commission; Kalamazoo County Board of Supervisors; Macomb County Board of Supervisors; Macomb County Road Commission; Oakland County Department of Public Works; Oakland County Drain Commission; Genesee County Drain Commission; Tri-County Planning Commission; Washtenaw County Drain Commission; Washtenaw County Planning Commission; Huron-Clinton Metropolitan Authority; Township of Ypsilanti, Cities of Ann Arbor, Battle Creek, Coldwater, Imlay City, Ironwood, Jackson, Lansing, and Ypsilanti; Allied Paper Inc.; American Aggregate Corp.; Consumers Power Co.; Cleveland-Cliffs Iron Co.; Detroit Edison Co.; Fisher Body Division of General Motors Corp.; Hanna Mining Co.; Michigan Power Co.; Michigan Sugar Co.; Peter Eckrich and Sons, Inc.; Upper Peninsula Power Co.; and Wisconsin-Michigan Power Co.

Organizations that supplied data are acknowledged in station descriptions.



## ACKNOWLEDGMENT

Michigan district personnel who contributed significantly to the collection and preparation of the data in this report were: J.B. Miller, chief, network operations, assisted by J.L. Oberg, L.B. Hough, T. Sieger, R.L. LeuVoy, G.C. Huffman, and B.A. Kuczera.

## HYDROLOGIC CONDITIONS

Streamflow during the 1978 water year was above median in the Upper Peninsula and below median in the Lower Peninsula. This was particularly evident during the summer months. Streamflow in the Upper Peninsula at the index station Sturgeon River near Sidnaw was the highest August flow in 38 years of record. September flow was the 4th highest. In the Lower Peninsula streamflow was deficient (in the lower 25 percent of record) during July and August. Moderate to heavy precipitation during September increased streamflow to above or near median throughout the State. Runoff at Red Cedar River for the 1978 water year was deficient for the second consecutive year.

In figure 1, the monthly and annual mean discharge is compared with the median discharge for the period 1941-70 at the three index stations.

Ground-water levels were below average in the central part of the Lower Peninsula and in the eastern part of the Upper Peninsula for most of the year. Elsewhere levels responded to local climatic conditions but were near average for the year.

## DEFINITION OF TERMS

Terms related to streamflow, water-quality, and other hydrologic data, as used in this report, are defined below. See also the table for converting English units to International System of units (SI) on the inside of the back cover.

Acre-foot (AC-FT, acre-ft) is the quantity of water required to cover 1 acre to a depth of 1 foot and is equivalent to 43,560 cubic feet or about 326,000 gallons or 1,233 cubic meters.

Adenosine triphosphate (ATP) is the primary energy donor in cellular life process. Its central role in living cells makes it an excellent indicator of the presence of living material in water. A measure of ATP therefore provides a sensitive and rapid estimate of biomass. ATP is reported in micrograms per liter of the original water sample.

Algae are mostly aquatic single-celled, colonial, or multi-celled plants, containing chlorophyll and lacking roots, stems, and leaves.

Algal growth potential (AGP) is the maximum algal dry weight biomass that can be produced in a natural water sample under standardized laboratory conditions. The growth potential is the algal biomass present at stationary phase and is expressed as milligrams dry weight of algae produced per liter of sample.

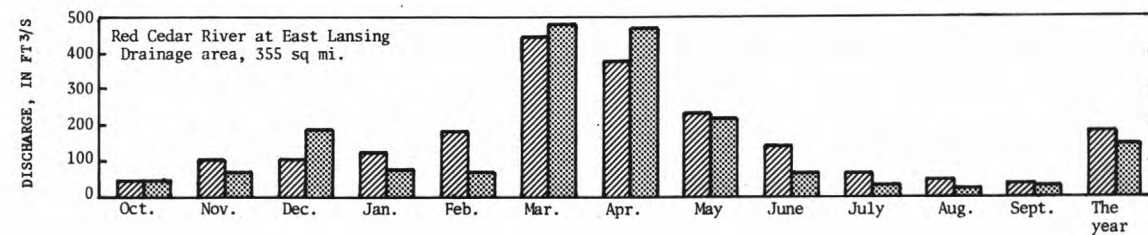
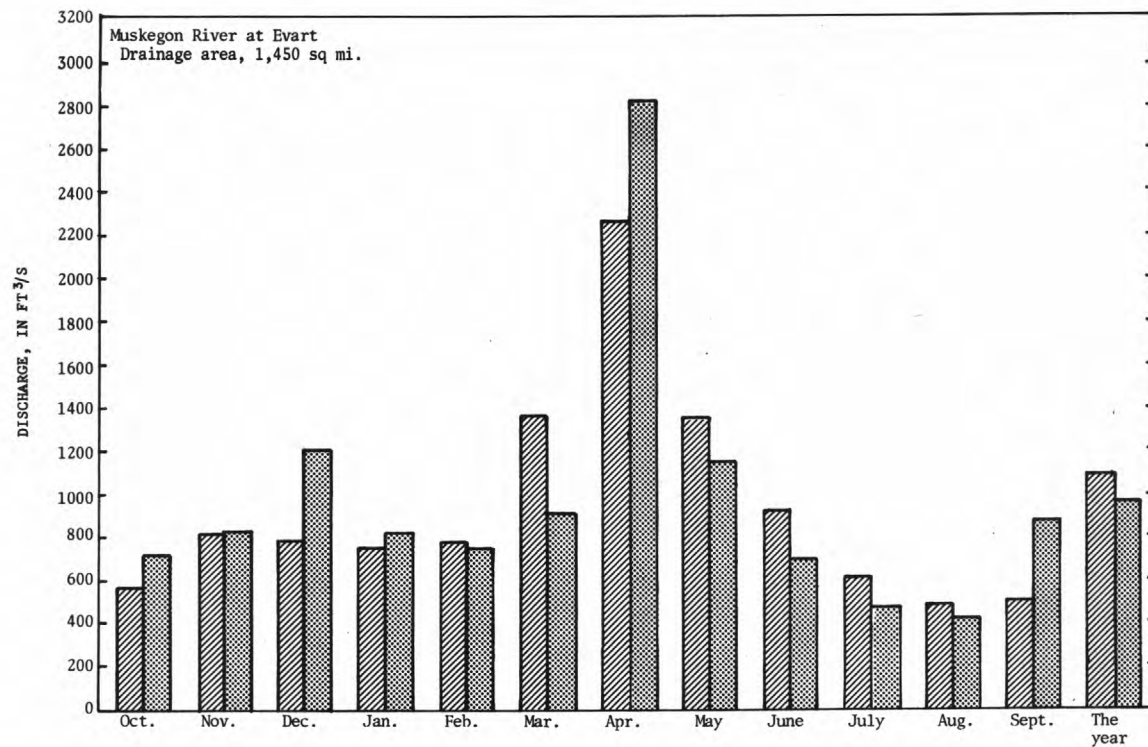
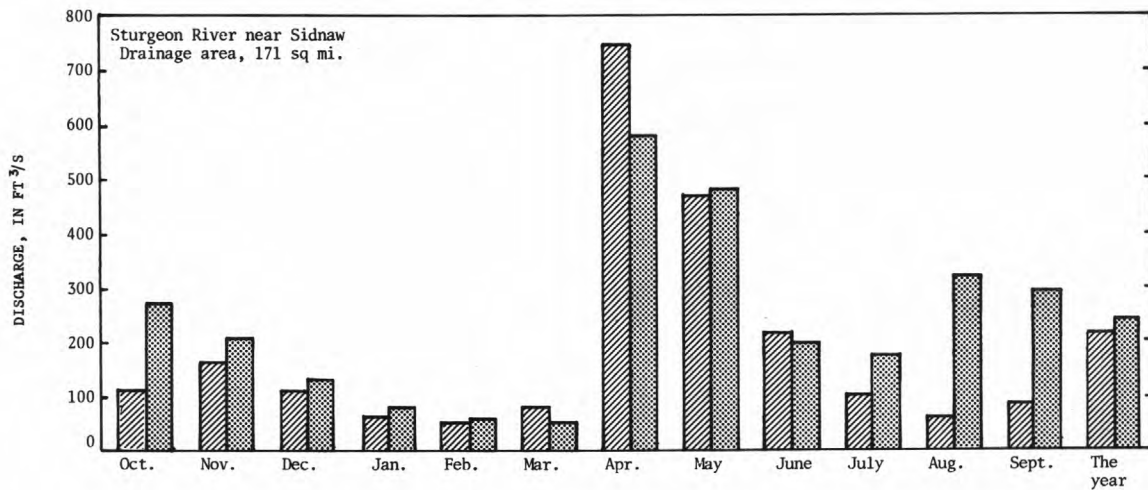
Aquifer is a geologic formation, group of formations, or part of a formation that contains sufficient saturated permeable material to yield significant quantities of water to wells and springs.

Artesian means confined and is used to describe a well in which the water level stands above the top of the aquifer, tapped by the well. A flowing artesian well is one in which the water level is above the land surface.

Bacteria are microscopic unicellular organisms, typically spherical, rodlike, or spiral and thread-like in shape, often clumped into colonies. Some bacteria cause disease, others perform an essential role in nature in the recycling of materials; for example, by decomposing organic matter into a form available for reuse by plants.

Total coliform bacteria are a particular group of bacteria that are used as indicators of possible sewage pollution. They are characterized as aerobic or facultative anaerobic, gram-negative, nonspore-forming, rod-shaped bacteria which ferment lactose with gas formation within 48 hours at 35°C. In the laboratory these bacteria are defined as the organisms which produce colonies within 24 hours when incubated at 35°C ± 1.0°C on M-Endo medium (nutrient medium for bacterial growth). Their concentrations are expressed as number of colonies per 100 mL of sample.

Fecal coliform bacteria are bacteria that are present in the intestines or feces of warm-blooded animals. They are often used as indicators of the sanitary quality of the water. In the laboratory they are defined as all organisms which produce blue colonies within 24 hours when incubated at 44.5°C ± 0.2°C on M-FC medium (nutrient medium for bacterial growth). Their concentrations are expressed as number of colonies per 100 mL of sample.



▨ Median of monthly and yearly mean discharge for period 1941-70.

▤ Monthly and yearly mean discharge during 1978 water year.

Figure 1. Discharge during 1978 water year compared with median discharge for period 1941-70 for three representative stations.

Fecal streptococcal bacteria are bacteria found also in intestines of warm-blooded animals. Their presence in water is considered to verify fecal pollution. They are characterized as gram-positive, cocci bacteria which are capable of growth in brain-heart infusion broth. In the laboratory they are defined as all the organisms which produce red or pink colonies within 48 hours at  $35^{\circ}\text{C} \pm 1.0^{\circ}\text{C}$  on M-enterococcus medium (nutrient medium for bacterial growth). Their concentrations are expressed as number of colonies per 100 mL of sample.

Bed material is the unconsolidated material of which a streambed, lake, pond, reservoir, or estuary bottom is composed.

Biochemical oxygen demand (BOD) is a measure of the quantity of dissolved oxygen, in milligrams per liter, necessary for the decomposition of organic matter by microorganisms, such as bacteria.

Biomass is the amount of living matter present at any given time, expressed as the mass per unit area of volume of habitat.

Ash mass is the mass or amount of residue present after the residue from the dry mass determination has been ashed in a muffle furnace at a temperature of  $500^{\circ}\text{C}$  for 1 hour. The ash mass values of zooplankton and phytoplankton are expressed in grams per cubic meter ( $\text{g}/\text{m}^3$ ), and periphyton and benthic organisms in grams per square meter ( $\text{g}/\text{m}^2$ ).

Dry mass refers to the mass of residue present after drying in an oven at  $60^{\circ}\text{C}$  for zooplankton and  $105^{\circ}\text{C}$  for periphyton, until the mass remains unchanged. This mass represents the total organic matter, ash and sediment, in the sample. Dry mass values are expressed in the same units as ash mass.

Organic mass or volatile mass of the living substance is the difference between the dry mass and ash mass, and represents the actual mass of the living matter. The organic mass is expressed in the same units as for ash mass and dry mass.

Wet mass is the mass of living matter plus contained water.

Bottom material: See Bed material.

Cells/volume refers to the number of cells of any organism which is counted by using a microscope and grid or counting cell. Many planktonic organisms are multicelled and are counted according to the number of contained cells per sample, usually milliliters (mL) or liters (L).

Cfs-day is the volume of water represented by flow of 1 cubic foot per second for 24 hours. It is equivalent to 86,400 cubic feet, approximately 1.9835 acre-feet, about 646,000 gallons or 2,447 cubic meters.

Chemical oxygen demand (COD) is a measure of the chemically oxidizable material in the water, and furnishes an approximation of the amount of organic and reducing material present. The determined value may correlate with natural water color or with carbonaceous organic pollution from sewage or industrial wastes.

Chlorophyll refers to the green pigments of plants. Chlorophyll a and b are the two most common pigments in plants.

Color unit is produced by one milligram per liter of platinum in the form of the chloroplatinate ion. Color is expressed in units of the platinum-cobalt scale.

Contents is the volume of water in a reservoir or lake. Unless otherwise indicated, volume is computed on the basis of a level pool and does not include bank storage.

Control designates a feature downstream from the gage that determines the stage-discharge relation at the gage. This feature may be a natural constriction of the channel, an artificial structure, or a uniform cross section over a long reach of the channel.

Control structure as used in this report is a structure on a stream or canal that is used to regulate the flow or stage of the stream or to prevent the intrusion of salt water.

Cubic feet per second per square mile (CFSM) is the average number of cubic feet of water flowing per second from each square mile of area drained, assuming that the runoff is distributed uniformly in time and area.

Cubic foot per second ( $\text{ft}^3/\text{s}$ ,  $\text{ft}^3/\text{s}$ ) is the rate of discharge representing a volume of 1 cubic foot passing a given point during 1 second and is equivalent to approximately 7.48 gallons per second or 448.8 gallons per minute or 0.02832 cubic meters per second.

Discharge is the volume of water (or more broadly, volume of fluid plus suspended sediment), that passes a given point within a given period of time.

Mean discharge (MEAN) is the arithmetic mean of individual daily mean discharges during a specific period.

Instantaneous discharge is the discharge at a particular instant of time.

Dissolved refers to the amount of substance present in true chemical solution. In practice, however, the term includes all forms of substance that will pass through a 0.45-micrometer membrane filter, and thus may include some very small (colloidal) suspended particles. Analyses are performed on filtered samples.



Diversity index is a numerical expression of evenness of distribution of aquatic organisms. The formula for diversity index is:

$$\bar{d} = - \sum_{i=1}^s \frac{n_i}{n} \log_2 \frac{n_i}{n}$$

Where  $n_i$  is the number of individuals per taxon,  $n$  is the total number of individuals, and  $s$  is the total number of taxa in the sample of the community. Diversity index values range from zero, when all the organisms in the sample are the same, to some positive number, when some or all of the organisms in the sample are different.

Drainage area of a stream at a specific location is that area, measured in a horizontal plane, enclosed by a topographic divide from which direct surface runoff from precipitation normally drains by gravity into the river above the specified point. Figures of drainage area given herein include all closed basins, or noncontribution areas, within the area unless otherwise noted.

Drainage basin is a part of the surface of the earth that is occupied by a drainage system, which consists of a surface stream or a body of impounded surface water together with all tributary surface streams and bodies of impounded surface water.

Gage height (G.H.) is the water-surface elevation referred to some arbitrary gage datum. Gage height is often used interchangeably with the more general term "stage", although gage height is more appropriate when used with a reading on a gage.

Gaging station is a particular site on a stream, canal, lake, or reservoir where systematic observations of hydrologic data are obtained.

Hardness of water is a physical-chemical characteristic that is commonly recognized by the increased quantity of soap required to produce lather. It is attributable to the presence of alkaline earths (principally calcium and magnesium) and is expressed as equivalent calcium carbonate ( $\text{CaCO}_3$ ).

Hydrologic unit is a geographic area representing part or all of a surface drainage basin or distinct hydrologic feature as delineated by the Office of Water Data Coordination on the State Hydrologic Unit Maps; each hydrologic unit is identified by an 8-digit number.

Metamorphic stage refers to the stage of development that an organism exhibits during its transformation from an immature form to an adult form. This developmental process exists for most insects, and the degree of difference from the immature stage to the adult form varies from relatively slight to pronounced, with many intermediates. Examples of metamorphic stages of insects are egg-larva-adult or egg-nymph-adult.

Methylene blue active substance (MBAS) is a measure of apparent detergents. This determination depends on the formation of a blue color when methylene blue dye reacts with synthetic detergent compounds.

Micrograms per gram (ug/g) is a unit expressing the concentration of a chemical element as the mass (micrograms) of the element sorbed per unit mass (gram) of sediment.

Micrograms per liter (UG/L, ug/L) is a unit expressing the concentration of chemical constituents in solution as mass (micrograms) of solute per unit volume (liter) of water. One thousand micrograms per liter is equivalent to one milligram per liter.

Milligrams per liter (MG/L, mg/L) is a unit for expressing the concentration of chemical constituents in solution. Milligrams per liter represent the mass of solute per unit volume (liter) of water. Concentration of suspended sediment also is expressed in mg/L, and is based on the mass of sediment per liter of water-sediment mixture.

National Geodetic Vertical Datum of 1929 (NGVD) is a geodetic datum derived from a general adjustment of the first order level nets of both the United States and Canada. It was formerly called "Sea Level Datum of 1929" or "mean sea level" in this series of reports. Although the datum was derived from the average sea level over a period of many years at 26 tide stations along the Atlantic, Gulf of Mexico, and Pacific Coasts, it does not necessarily represent local mean sea level at any particular place.

Organism is any living entity, such as an insect, phytoplankter, or zooplankter.

Organism count/area refers to the number of organisms collected and enumerated in a sample and adjusted to the number per area habitat, usually square meters ( $\text{m}^2$ ), acres, or hectares. Periphyton benthic organisms, and macrophytes are expressed in these terms.

Organism count/volume refers to the number of organisms collected and enumerated in a sample and adjusted to the number per sample volume, usually milliliters (mL) or liters (L). Numbers of planktonic organisms can be expressed in these terms.

Total organism count is the total number of organisms collected and enumerated in any particular sample.

Partial-record station is a particular site where limited streamflow and/or water-quality data are collected systematically over a period of years for use in hydrologic analyses.

Particle-size is the diameter, in millimeters (mm), of suspended sediment or bed material determined by either sieve or sedimentation methods. Sedimentation methods (pipet, bottom-withdrawal tube, visual-accumulation tube) determine fall diameter of particles in either distilled water (chemically dispersed) or in native water (the river water at the time and point of sampling).

Particle-size classification used in this report agrees with recommendations made by the American Geophysical Union Subcommittee on Sediment Terminology.

The classification is as follows:

Classification	Size (mm)	Method of analysis
Clay . . . . .	0.00024 - 0.004	Sedimentation
Silt . . . . .	.004 - .062	Sedimentation
Sand . . . . .	.062 - 2.0	Sedimentation or sieve
Gravel . . . . .	2.0 - 64.0	Sieve

The particle-size distributions given in this report are not necessarily representative of all particles in transport in the stream. Most of the organic material is removed and the sample is subjected to mechanical and chemical dispersion before analysis in distilled water. Chemical dispersion is not used for native water analysis.

Percent composition is a unit for expressing the ratio of a particular part of a sample or population to the total sample or population, in terms of types, numbers, mass or volume.

Periphyton is the assemblage of microorganisms attached to and growing upon solid surfaces. While primarily consisting of algae, they also include bacteria, fungi, protozoa, rotifers, and other small organisms. Periphyton is a useful indicator of water quality.

Pesticides are chemical compounds used to control undesirable plants and animals. Major categories of pesticides include insecticides, miticides, fungicides, herbicides, and rodenticides. Insecticides and herbicides, which control insects and plants respectively, are the two categories reported.

Picocurie (PC, pCi) is one trillionth ( $1 \times 10^{12}$ ) of the amount of radioactivity represented by a curie (Ci). A curie is the amount of radio activity that yields  $3.7 \times 10^{10}$  radio active disintegration per second. A picocurie yields 2.22 dpm (disintegrations per minute).

Plankton is the community of suspended, floating, or weakly swimming organisms that live in the open water of lakes and rivers.

Phytoplankton is the plant part of the plankton. They are usually microscopic and their movement is subject to the water currents. Phytoplankton growth is dependent upon solar radiation and nutrient substances. Because they are able to incorporate as well as release materials to the surrounding water, the phytoplankton have a profound effect upon the quality of the water. They are the primary food producers in the aquatic environment, and are commonly known as algae.

Blue-green algae are a group of phytoplankton organisms having a blue pigment, in addition to the green pigment called chlorophyll. Blue-green algae often cause nuisance conditions in water.

Diatoms are the unicellular or colonial algae having a siliceous shell. Their concentrations are expressed as number of cells/mL of sample.

Green algae have chlorophyll pigments similar in color to those of higher green plants. Some forms produce algal mats or floating "moss" in lakes. Their concentrations are expressed as number of cells/mL of sample.

Zooplankton is the animal part of the plankton. Zooplankton are capable of extensive movements within the water column, and are often large enough to be seen with the unaided eye. Zooplankton are secondary consumers feeding upon bacteria, phytoplankton, and detritus. Because they are the grazers in the aquatic environment, the zooplankton are a vital part of the aquatic food web. The zooplankton community is dominated by small crustaceans and rotifers.

Polychlorinated biphenyls (PCBs) are industrial chemicals that are mixtures of chlorinated biphenyl compounds having various percentages of chlorine. They are similar in structure to organochlorine insecticides.

Primary productivity is a measure of the rate at which new organic matter is formed and accumulated through photosynthetic and chemosynthetic activity of producer organisms (chiefly green plants). The rate of primary production is estimated by measuring the amount of oxygen released (oxygen method) or the amount of carbon assimilated by the plants (carbon method).

Milligrams of carbon per area or volume per unit time [mg C/(m<sup>2</sup>·time)] for periphyton and macrophytes and [mg C/(m<sup>3</sup>·time)] for phytoplankton are units for expressing primary productivity. They define the amount of carbon dioxide consumed as measured by radioactive carbon (carbon 14). The carbon 14 method is of greater sensitivity than the oxygen light and dark bottle method, and is preferred for use in unenriched waters. Unit time may be either the hour or day, depending on the incubation period.

Milligrams of oxygen per area or volume per unit time [mg O<sub>2</sub>/(m<sup>2</sup>·time)] for periphyton and macrophytes and [mg O<sub>2</sub>/(m<sup>3</sup>·time)] for phytoplankton are the units for expressing primary productivity. They define production and respiration rates as estimated from changes in the measured dissolved oxygen concentration. The oxygen light and dark bottle method is preferred if the rate of primary production is sufficient for accurate measurements to be made within 24 hours. Unit time may be either the hour or day, depending on the incubation period.

Runoff in inches (IN, in) shows the depth to which the drainage area would be covered if all the runoff for a given time period were uniformly distributed on it.

Sediment is solid material that originates mostly from disintegrated rocks and is transported by, suspended in, or deposited from water; it includes chemical and biochemical precipitates and decomposed organic material, such as humus. The quantity, characteristics, and cause of the occurrence of sediment in streams are influenced by environmental factors. Some major factors are degree of slope, length of slope, soil characteristics, land usage, and quantity and intensity of precipitation.

Suspended sediment is the sediment that at any given time is maintained in suspension by the upward components of turbulent currents or that exists in suspension as a colloid.

Suspended-sediment concentration is the velocity-weighted concentration of suspended sediment in the sampled zone (from the water surface to a point approximately 0.3 ft above the bed) expressed as milligrams of dry sediment per liter of water-sediment mixture (mg/L).

Suspended-sediment discharge (tons/day) is the rate at which dry weight of sediment passes a section of a stream or is the quantity of sediment, as measured by dry weight or volume, that passes a section in a given time. It is computed by multiplying discharge times mg/L times 0.0027.

Suspended-sediment load is quantity of suspended sediment passing a section in a specified period.

Total sediment discharge (tons/day) is the sum of the suspended-sediment discharge and the bed-load discharge. It is the total quantity of sediment, as measured by dry weight or volume, that passes a section during a given time.

Mean concentration is the time-weighted concentration of suspended sediment passing a stream section during a 24-hour day.

Solute is any substance derived from the atmosphere, vegetation, soil, or rocks that is dissolved in water.

Specific conductance is a measure of the ability of a water to conduct an electrical current. It is expressed in micromhos per centimeter at 25°C. Specific conductance is related to the type and concentration of ions in solution and can be used for approximating the dissolved-solids content of the water. Commonly, the concentration of dissolved solids (in milligrams per liter) is about 65 percent of the specific conductance (in micromhos). This relation is not constant from stream to stream, and it may vary in the same source with changes in the composition of the water.

Stage-discharge relation is the relation between gage height (stage) and volume of water per unit of time, flowing in a channel.

Streamflow is the discharge that occurs in a natural channel. Although the term "discharge" can be applied to the flow of a canal, the word "streamflow" uniquely describes the discharge in a surface stream course. The term "streamflow" is more general than "runoff" as streamflow may be applied to discharge whether or not it is affected by diversion or regulation.

Substrate is the physical surface upon which an organism lived.

Natural substrates refers to any naturally occurring emersed or submersed solid surface, such as a rock or tree, upon which an organism lived.

Artificial substrate is a device which is purposely placed in a stream or lake for colonization of organisms. The artificial substrate simplifies the community structure by standardizing the substrate from which each sample is taken. Examples of artificial substrates are basket samplers (made of wire cages filled with clean streamside rocks) and multi-plate samplers (made of hardboard) for benthic organism collection, and plexiglass strips for periphyton collection.

Surface area of a lake is that area outlined on the latest U.S.G.S. topographic map as the boundary of the lake and measured by a planimeter in acres. In localities not covered by topographic maps, the areas are computed from the best maps available at the time planimetered. All areas shown are those for the stage when the planimetered map was made.

Surficial bed material is that part (0.1 to 0.2 ft) of the bed material that is sampled using U.S. Series Bed-Material Samplers.

Suspended (as used in tables of chemical analyses) refers to the amount (concentration) of the total concentration in a water-sediment mixture. The water-sediment mixture is associated with (or sorbed on) that material retained on a 0.45 micrometer filter.

Taxonomy is the division of biology concerned with the classification and naming of organisms. The classification of organisms is based upon a hierarchical scheme beginning with Kingdom and ending with Species at the base. The higher the classification level, the fewer features the organisms have in common. For example, the taxonomy of a particular mayfly, Hexagenia limbata is the following:

Kingdom.....Animal  
Phylum.....Arthropoda  
Class.....Insecta  
Order.....Ephemeroptera  
Family.....Ephemeridae  
Genus.....Hexagenia  
Species.....Hexagenia limbata

Time-weighted average is computed by multiplying the number of days in the sampling period by the concentrations of individual constituents for the corresponding period and dividing the sum of the products by the total number of days. A time-weighted average represents the composition of water that would be contained in a vessel or reservoir that had received equal quantities of water from the stream each day for the year.



Tons per acre-foot indicates the dry mass of dissolved solids in 1 acre-foot of water. It is computed by multiplying the concentration in milligrams per liter by 0.00136.

Tons per day is the quantity of substance in solution or suspension that passes a stream section during a 24-hour day.

Total load (tons) is the total quantity of any individual constituent, as measured by dry mass or volume, that is dissolved in a specific amount of water (discharge) during a given time. It is computed by multiplying the total discharge, times the mg/L of the constituent, times the factor 0.0027, times the number of days.

Weighted average is used in this report to indicate discharge-weighted average. It is computed by multiplying the discharge for a sampling period by the concentrations of individual constituents for the corresponding period and dividing the sum of the products by the sum of the discharges. A discharge-weighted average approximates the composition of water that would be found in a reservoir containing all the water passing a given location during the water year after thorough mixing in the reservoir.

WDR is used as an abbreviation for "Water-Data Report: in reference to published reports beginning in 1975.

WRD is used as an abbreviation for "Water-Resources Data" in the REVISED RECORDS paragraph to refer to State annual basic-data reports published before 1975.

WSP is used as an abbreviation for "Water-Supply Paper" in references to previously published reports.

#### DOWNSTREAM ORDER AND STATION NUMBER

Since October 1, 1950, the order of listing hydrologic-station records in Survey reports is in a downstream direction along the main stream. All stations on a tributary entering upstream from a main-stream station are listed before that station. A station on a tributary that enters between two main-stream stations is listed between them. A similar order is followed in listing stations on first rank, second rank, and other ranks of tributaries. The rank of any tributary on which a station is situated with respect to the stream to which it is immediately tributary is indicated by an indentation in a list of stations in the front of the report. Each indentation represents one rank. This downstream order and system of indentation show which stations are on tributaries between any two stations and the rank of the tributary on which each station is situated.

As an added means of identification, each hydrologic station, and partial-record station has been assigned a station number. These are in the same downstream order used in this report. In assigning station numbers, no distinction is made between partial-record and continuous-record stations; therefore, the station number for a partial-record station indicates downstream-order position in a list made up of both types of stations. Gaps are left in the series of numbers to allow for new stations that may be established; hence, the numbers are not consecutive. The complete 8-digit number for each station, such as 04058500, which appears just to the left of the station name, includes the 2-digit part number "04" plus the 6-digit downstream order number "058500".

#### NUMBERING SYSTEM FOR WELLS

Each well is identified by means of (1) a 15-digit number that is based on the grid system of latitude and longitude followed by (2) a local number that is provided for continuity with older reports and for other use as dictated by local needs.

Each well is located as a point on a map by a number based on the universal system of latitude and longitude. In this report, this is the first set of numbers shown for each well. For maximum utility, latitude and longitude numbers are determined to seconds. The first six digits denote degrees, minutes, and seconds of north latitude; the next seven digits denote degrees, minutes, and seconds of west longitude. The last two numbers are sequential numbers assigned in the order that the wells were recorded within a designated latitude-longitude grid.

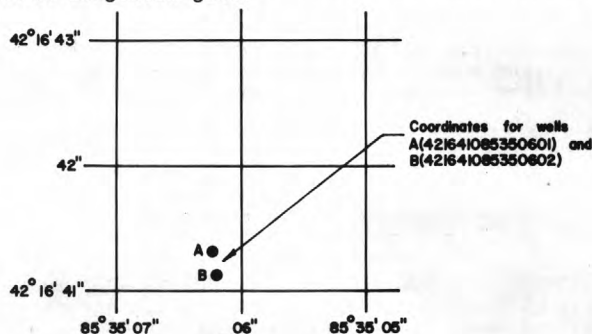


Figure 2. System for numbering wells (latitude and longitude).

The local well number indicates the location of wells within the rectangular subdivision of land with reference to the Michigan meridian and base line. The first two segments of the well number designate township and range, the third segment of the number designates the section and the letters A thru D designate successively smaller subdivisions of the section as shown in figure 3. Thus, a well designated as 32N 6E 16CCCB would be located to the nearest 2.5 acres (1 hectare) and would be within the shaded area in section 16. In the event that two or more wells are located in the same 2.5 acre (1 hectare) tract, a sequential number designation follows the letter designations--for example, 16CCCB1, 16CCCB2, 16CCCB3, etc.

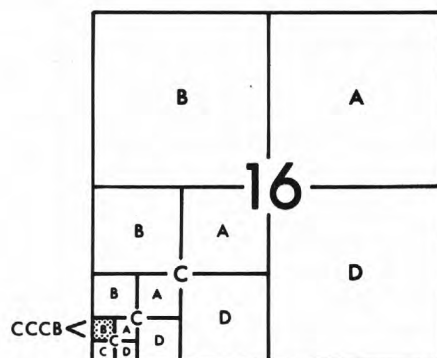


Figure 3. Well numbering system in Michigan.

#### SPECIAL NETWORKS AND PROGRAMS

Hydrologic bench-mark station is one that provides hydrologic data for a basin in which the hydrologic regimen will likely be governed solely by natural conditions. Data collected at a bench-mark station may be used to separate effects of natural from manmade changes in other basins which have been developed and in which the physiography, climate, and geology are similar to those in the undeveloped bench-mark basin.

National stream-quality accounting network (NASQAN) is a data collection network designed by the U.S. Geological Survey to meet many of the information demands of agencies or groups involved in national or regional water-quality planning and management. Both accounting and broad-scale monitoring objectives have been incorporated in the network design. Areal configuration of the network is based on river-basin accounting units (identified by 8-digit hydrologic-unit numbers) designated by the Office of Water Data Coordination in consultation with the Water Resources Council. Primary objectives of the network are (1) to depict areal variability of streamflow and water-quality conditions nationwide on a year-by-year basis and (2) to detect and assess long-term changes in stream quality.

Pesticide program is a network of regularly sampled water-quality stations where samples are collected to determine the concentration and distribution of pesticides in streams where potential contamination could result from the application of the commonly used insecticides and herbicides. Operation of the network is a Federal interagency activity.

Radiochemical program is a network of regularly sampled water-quality stations where samples are collected to be analyzed for radioisotopes. The streams that are sampled represent major drainage basins in the conterminous United States.

Tritium network is a network of stations which has been established to provide baseline information on the occurrence of tritium in the Nation's surface waters. In addition to the surface-water stations in the network, tritium data are also obtained at a number of precipitation stations. The purpose of the precipitation stations is to provide an estimate sufficient for hydrologic studies of the tritium input to the United States.

## WATER RESOURCES DATA FOR MICHIGAN, 1978

## EXPLANATION OF STAGE AND WATER-DISCHARGE

Collection and computation of data

The base data collected at gaging stations consist of records of stage and measurements of discharge of streams or canals, and stage, surface area, and contents of lakes or reservoirs. In addition, observations of factors affecting the stage-discharge relation or the stage-capacity relation, weather records, and other information are used to supplement base data in determining the daily flow or volume of water in storage. Records of stage are obtained from either direct readings on a nonrecording gage or from a water-stage recorder that gives either a continuous graph of the fluctuations or a tape punched at selected time intervals. Measurements of discharge are made with a current meter, using the general methods adopted by the Geological Survey. These methods are described in standard textbooks, in Water-Supply Paper 888, and in U.S. Geological Survey Techniques of Water Resources Investigations, book 3, chapter A6.

For stream-gaging stations, rating tables giving the discharge for any stage are prepared from stage-discharge relation curves. If extensions to the rating curves are necessary to express discharge greater than measured, they are made on the basis of indirect measurements of peak discharge (such as slope-area or contracted-opening measurements, computation of flow over dams or weirs), step-backwater techniques, velocity-area studies, and logarithmic plotting. The daily mean discharge is computed from gage heights and rating tables, then the monthly and yearly mean discharge are computed from the daily figures. If the stage-discharge relation is subject to change because of frequent or continual change in the physical features that form the control, the daily mean discharge is computed by the shifting-control method, in which correction factors based on individual discharge measurements and notes by engineers and observers are used in applying the gage heights to the rating tables. If the stage-discharge relation for a station is temporarily changed by the presence of aquatic growth or debris on the control, the daily mean discharge is computed by what is basically the shifting-control method.

At some stream-gaging stations the stage-discharge relation is affected by backwater from reservoirs, tributary streams, or other sources. This necessitates the use of the slope method in which the slope or fall in a reach of the stream is a factor in computing discharge. The slope or fall is obtained by means of an auxiliary gage set at some distance from the base gage. At some stations the stage-discharge relation is affected by changing stage; at these stations the rate of change in stage is used as a factor in computing discharge.

At some northern stream-gaging stations the stage-discharge relation is affected by ice in the winter, and it becomes impossible to compute the discharge in the usual manner. Discharge for periods of ice effect is computed on the basis of the gage-height record and occasional winter discharge measurements. Consideration is given to the available information on temperature and precipitation, notes by gage observers and hydrologist, and comparable records of discharge for other stations in the same or nearby basins.

For a lake or reservoir station, capacity tables giving the contents for any stage are prepared from stage-area relation curves defined by surveys. The application of the stage to the capacity table gives the contents, from which the daily, monthly, or yearly change in contents is computed.

If the stage-capacity curve is subject to changes because of deposition of sediment in the reservoir, periodic resurveys of the reservoir are necessary to define new stage-capacity curves. During the period between reservoir surveys the computed contents may be increasingly in error due to the gradual accumulation of sediment.

For some gaging stations there are periods when no gage-height record is obtained or the recorded gage height is so faulty that it cannot be used to compute daily discharge or contents. This happens when the recorder stops or otherwise fails to operate properly, intakes are plugged, the float is frozen in the well, or for various other reasons. For such periods the daily discharges are estimated on the basis of recorded range in stage, prior and subsequent records, discharge measurements, weather records, and comparison with records for other stations in the same or nearby basins. Likewise, daily contents may be estimated on the basis of operator's log, prior and subsequent records, inflow-outflow studies, and other information.

The data in this report generally comprise a description of the station and tabulations of daily and monthly figures. For gaging stations on streams or canals a table showing the daily discharge and monthly and yearly discharge is given. For gaging stations on lakes and reservoirs a monthly summary table of stage and contents or a table showing the daily contents is given. Tables of daily mean gage heights are included for some streamflow stations and for some reservoir stations. Records are published for the water year which begins on October 1 and ends on September 30.

The description of the gaging stations gives the location, drainage area, period of record, notations of revisions of previously published records, type and history of gages, general remarks, average discharge, and extremes of discharge or contents. The location of the gaging station and the drainage area are obtained from the most accurate maps available. River mileage, given under "LOCATION" for some stations, is that determined and used by the Corps of Engineers or other agencies. Periods for which there are published records for the present station or for stations generally equivalent to the present one are given under "PERIOD OF RECORD."

Previously published streamflow records of some stations have been found to be in error on the basis of data or information later obtained. Revisions of such records are usually published along with the current records in one of the annual or compilation reports. In order to make it easier to find such revised records, a paragraph headed "REVISED RECORDS" has been added to the description of



all stations for which revised records have been published. Listed therein are all the reports in which revisions have been published, each followed by the water years for which figures are revised in that report. In listing the water years only one number is given; for instance, 1965 stands for the water October 1, 1964, to September 30, 1965. If no daily, monthly, or annual figures of discharge are affected by the revision, the fact is brought out by notations after the year dates as follows: "(M)" means that only the instantaneous maximum discharge was revised; "(m)" that only the instantaneous minimum was revised; and "(P)" that only peak discharges were revised. If the drainage area has been revised, the report in which the revised figure was first published is given. It should be noted that for all stations for which cubic feet per second per square mile and runoff in inches are published, a revision of the drainage area necessitates corresponding revision of all figures based on the drainage area. Revised figures of cubic feet per second per square mile and runoff in inches resulting from a revision of the drainage area only are usually not published in the annual series of reports.

The type of gage currently in use; the datum of the present gage referred to National Geodetic Vertical Datum; and a condensed history of the types, locations, and datums of previous gages used during the period of record are given under "GAGE." National Geodetic Vertical Datum is explained in "DEFINITION OF TERMS" on page 5.

Information pertaining to the accuracy of the discharge records and to conditions which affect the natural flow of the gaging station is given under "REMARKS." For reservoir stations information on the dam forming the reservoir, the capacity, outlet works and spillway, and purpose and use of the reservoir is given under "REMARKS."

The average discharge for the number of years indicated is given under "AVERAGE DISCHARGE"; it is not given for stations having fewer than 5 complete years of record or for stations where changes in water development during the period of record cause the figure to have little significance. Under "EXTREMES" are given first, the extremes for the period of record, second, information available outside the period of record, and last, those for the current year. Unless otherwise qualified, the maximum discharge (or contents) is the instantaneous maximum corresponding to the crest stage obtained by use of a water-stage recorder (graphic or digital), a crest-stage gage, or a nonrecording gage read at the time of the crest. If the maximum gage height did not occur on the same day as the maximum discharge (or contents), it is given separately. Similarly, the minimum is the instantaneous minimum unless otherwise qualified. For some stations peak discharges are listed with "EXTREMES FOR THE CURRENT YEAR"; if they are, all independent peaks, including the maximum for the year, above the selected base with the time of occurrence and corresponding gage heights are published in tabular format. The base discharge, which is given in the table heading, is selected so that an average of about three peaks a year will be presented. Peak discharges are not published for any canals, ditches, drains, or for any stream for which the peaks are subject to substantial control by man. Time of day is expressed in 24-hour local standard time; for example, 12:30 a.m. is 0030, 1:30 p.m. is 1330. The minimums for these stations are published in a separate paragraph following the table of peaks.

The daily table for stream-gaging stations gives the mean discharge for each day and is followed by monthly and yearly summaries. In the monthly summary below the daily table, the line headed "TOTAL" gives the sum of the daily figures. The line headed "MEAN" gives the average flow in cubic feet per second during the month. The lines headed "MAX" and "MIN" give the maximum and minimum daily discharges, respectively, for the month. Discharge for the month also may be expressed in cubic feet per second per square mile (line headed "CFSM"), or in inches (line headed "IN."), or in acre-feet (line headed "AC-FT"). Figures for cubic feet per second per square mile and runoff in inches are omitted if there is extensive regulation or diversion, if the drainage area includes large noncontributing areas, or if the average annual rainfall over the drainage basin is usually less than 20 inches. In the yearly summary below the monthly summary, the figures shown are the appropriate daily discharges for the calendar and water years.

Footnotes to the table of daily discharges are introduced by the word "NOTE." Footnotes are used to indicate periods for which the discharge is computed or estimated by special methods because of no gage-height record, backwater from various sources, or other unusual conditions. Periods of no gage-height record are indicated if the period is continuous for a month or more or includes the maximum discharge for the year. Periods of backwater from an unusual source, of indefinite stage-discharge relation, or of any other unusual condition at the gage site are indicated only if they are a month or more in length and the accuracy of the records is affected. Days on which the stage-discharge relation is affected by ice are not indicated. The methods used in computing discharge for various unusual conditions have been explained in preceding paragraphs.

For most gaging stations on lakes and reservoirs the data presented comprise a description of the station and a monthly summary table of stage and contents. For some reservoirs a table showing daily contents or stage is given. A skeleton table of capacity at given stages is published for most reservoirs for which records are published on a daily basis, but is not published for reservoirs for which only monthly data are given.

Data collected at partial-record stations follow the information for continuous-record sites. Data for partial-record discharge stations are presented in two tables. The first is a table of discharge measurements at low-flow partial-record stations, and the second is a table of annual maximum stage and discharge at crest-stage stations. The tables of partial-record stations are followed by a listing of discharge measurements made at sites other than continuous-record or partial-record stations. Occasionally, a series of discharge measurements are made within a short time period to investigate the seepage gains or losses along a reach of a stream or to determine the low-flow characteristics of an area. Such measurements are also given in special tables following the tables of partial-record stations.

#### Accuracy of data

The accuracy of streamflow data depends primarily on (1) the stability of the stage-discharge relation or, if the control is unstable, the frequency of discharge measurements, and (2) the accuracy of observations of stage, measurements of discharge, and interpretation of records.

The station description under "REMARKS" states the degree of accuracy of the records. "Excellent" means that about 95 percent of the daily discharges are within 5 percent; "good" within 10 percent; and "fair" within 15 percent. "Poor" means that daily discharges have less than "fair" accuracy.

Figures of daily mean discharge in this report are shown to the nearest hundredth of a cubic foot per second for discharges of less than 1 cfs; to tenths between 1.0 and 10 cfs; to whole numbers between 10 and 1,000 cfs; and to 3 significant figures above 1,000 cfs. The number of significant figures used is based solely on the magnitude of the figure. The same rounding rules apply to discharge figures listed for partial-record stations.

Discharge at many stations, as indicated by the monthly mean, may not reflect natural runoff due to the effects of diversion, consumption, regulation by storage, increase or decrease in evaporation due to artificial causes, or to other factors. For such stations, figures of cubic feet per second per square mile and of runoff in inches are not published unless satisfactory adjustments can be made for diversions, for changes in contents of reservoirs, or for other changes incident to use and control. Evaporation from a reservoir is not included in the adjustments for changes in reservoir contents, unless it is so stated. Even at those stations where adjustments are made, large errors in computed runoff may occur if adjustments or losses are large in comparison with the observed discharge.

#### Other data available

Information of a more detailed nature than that published for most of the gaging stations, such as observations of water temperatures, discharge measurements, gage-height records, and rating tables, is on file in the district office. Also, most gaging-station records are available in computer-usable form and many statistical analyses have been made.

Information on the availability of unpublished data or statistical analyses may be obtained from the district office.

### EXPLANATION OF WATER QUALITY RECORDS

#### Collection and examination of data

Surface-water samples for analyses usually are collected at or near gaging stations. The quality-of-water records are given immediately following the discharge records at these stations.

The descriptive heading for water-quality records gives the period of record for all water-quality data; the period of daily record for parameters that are measured on a daily basis (specific conductance, pH, dissolved oxygen, water temperature, sediment discharge, etc.); extremes for the period of daily record; extremes for the current year; and general remarks.

For ground-water records, no descriptive statements are given; however, the well number, depth of well, date of sampling and/or other pertinent data are given in the table containing the chemical analyses of the ground water.

#### Water analysis

Most methods for collecting and analyzing water samples are described in the U.S. Geological Survey Techniques of Water Resources Investigations listed on a following page.

One sample can define adequately the water quality at a given time if the mixture of solutes throughout the stream cross section is homogeneous. However, the concentration of solutes at different locations in the cross section may vary widely with different rates of water discharge, depending on the source of material and the turbulence and mixing of the stream. Some streams must be sampled through several vertical sections to obtain a representative sample needed for an accurate mean concentration and for use in calculating load.

Chemical-quality data published in this report are considered to be the most representative values available for the stations listed. The values reported represent water-quality conditions at the time of sampling as much as possible, consistent with available sampling techniques and methods of analysis. In the rare case where an apparent inconsistency exists between a reported pH value and the relative abundance of carbon dioxide species (carbonate and bicarbonate), the inconsistency is the result of a slight uptake of carbon dioxide from the air by the sample between measurement of pH in the field and determination of carbonate and bicarbonate in the laboratory.

For chemical-quality stations equipped with digital monitors, the records consist of daily maximum, minimum, and mean values for each constituent measured and are based upon hourly punches beginning at 0100 hours and ending at 2400 hours for the day of record. More detailed records (hourly values) may be obtained from the district office.

#### Water temperature

Water temperatures are measured at most of the water-quality stations. In addition, water temperatures are taken at time of discharge measurements for water-discharge stations. For stations where water temperatures are taken manually once or twice daily, the water temperatures are taken at about the same time each day. Large streams have a small daily temperature change; shallow streams may have a daily range of several degrees and may follow closely the changes in air temperature. Some streams may be affected by waste-heat discharge.

At stations where recording instruments are used, either mean temperatures or maximum and minimum temperatures for each day are published.

#### Sediment

Suspended-sediment concentrations are determined from samples collected by using depth-integrating samplers. Samples usually are obtained at several verticals in the cross section, or a single sample may be obtained at a fixed point and a coefficient applied to determine the mean concentration in the cross sections.

During periods of rapidly changing flow or rapidly changing concentration, samples may have been collected more frequently (twice daily or, in some instances, hourly). The published sediment discharges for days of rapidly changing flow or concentration were computed by the subdivided day method (time-discharge weighted average). Therefore, for those days when the published sediment discharge value differs from the value computed as the product of discharge times mean concentration times 0.0027, the reader can assume that the sediment discharge for that day was computed by the subdivided day method. For periods when no samples are collected, daily loads of suspended sediment were estimated on the basis of water discharge, sediment concentrations observed immediately before and after the periods, and suspended-sediment loads for other periods of similar discharge.

At other stations, suspended-sediment samples are collected periodically at many verticals in the stream cross section. Although data collected periodically may represent conditions only at the time of observation, such data are useful in establishing seasonal relations between quality and streamflow in predicting long-term sediment-discharge characteristics of the stream.

In addition to the records of the quantities of suspended sediment, records of periodic measurements of the particle-size distribution of the suspended sediment and bed material are included.

### EXPLANATION OF GROUND-WATER LEVEL RECORDS

#### Collection of the data

Only ground-water level data from a basic national network of observation wells are published herein. This basic network contains observation wells so located (figure 9) that the most significant data are obtained from the fewest wells in the most important aquifers.

Each well is identified by means of (1) a 15-digit number that is based on latitude and longitude, and (2) a local number that is provided for local needs. See figures 2 and 3.

Measurements are made in many types of wells under varying conditions of access and of different temperatures, hence neither the method of measurement nor the equipment can be standardized. At each observation well, however, the equipment and techniques used are those that will insure that measurements at each well are consistent.

Water-level measurements in this report are given in feet with reference to either mean sea level (msl) or land-surface datum (lsd). Mean sea level is the datum plane on which the national network of precise levels is based; land-surface datum is a datum plane that is approximately at land surface at each well. If known, the altitude of the land-surface datum above mean sea level is given in the well description. The height of the measuring point (MP) above or below land-surface datum is given in each well description. Water levels in wells equipped with recording gages are reported for every fifth day and the end of each month (eom).

Water levels are reported to as many significant figures as can be justified by the local conditions. For example, in a measurement of a depth to water of several hundred feet, the error of determining the absolute value of the total depth to water may be a few tenths of a foot, whereas the error in determining the net change of water level between successive measurements may be only a hundredth or a few hundredths of a foot. For lesser depths to water, the accuracy is greater. Accordingly, most measurements are reported to a hundredth of a foot, but some are given only to a tenth of a foot or a larger unit.



Thirty-four manuals by the U.S. Geological Survey have been published to date in the series on techniques describing procedures for planning and executing specialized work in water-resources investigations. The material is grouped under major subject headings called books and is further divided into sections and chapters. For example, Section A of Book 3 (Applications of Hydraulics) is on surface water. The chapter, the unit of publication, is limited to a narrow field of subject matter. This format permits flexibility in revision and publication as the need arises. The reports listed below are for sale by the U.S. Geological Survey, Branch of Distribution, 1200 South Eads Street, Arlington, VA 22202 (authorized agent of the Superintendent of Documents, Government Printing Office. Prices are effective October 1978 but are subject to change.

NOTE: When ordering any of these publications, please give the title, book number, chapter number, and "U.S. Geological Survey Techniques of Water-Resources Investigations".

- 1-D1. *Water temperature-influential factors, field measurement, and data presentation*, by H. H. Stevens Jr., J. F. Ficke, and G. F. Smoot: USGS--TWRI Book 1, Chapter D1. 1975. 65 pages. \$1.60.
- 1-D2. *Guidelines for collection and field analysis of ground-water samples for selected unstable constituents*, by W.W. Wood: USGS--TWRI Book 1, Chapter D2. 1976. 24 pages. \$0.85
- 2-D1. *Application of surface geophysics to ground-water investigations*, by A. A. R. Zohdy, G. P. Eaton, and D. R. Mabey: USGS--TWRI Book 2, Chapter D1. 1974. 116 pages. \$1.90.
- 2-E1. *Application of borehole geophysics to water-resources investigations*, by W. S. Keys and L. M. MacCary: USGS--TWRI Book 2, Chapter E1. 1971. 126 pages. \$1.75.
- 3-A1. *General field and office procedures for indirect discharge measurements*, by M. A. Benson and Tate Dalrymple: USGS--TWRI Book 3, Chapter A1. 1967. 30 pages. \$1.00.
- 3-A2. *Measurement of peak discharge by the slope-area method*, by Tate Dalrymple and M. A. Benson: USGS--TWRI Book 3, Chapter A2. 1967. 12 pages. \$0.35.
- 3-A3. *Measurement of peak discharge at culverts by indirect methods*, by G. L. Bodhaine: USGS--TWRI Book 3, Chapter A3. 1968. 60 pages. \$0.40.
- 3-A4. *Measurement of peak discharge at width contractions by indirect methods*, by H. F. Matthai: USGS--TWRI Book 3, Chapter A4. 1967. 44 pages. \$1.00.
- 3-A5. *Measurement of peak discharge at dams by indirect methods*, by Harry Hulsing: USGS--TWRI Book 3, Chapter A5. 1967. 29 pages. \$0.35.
- 3-A6. *General procedure for gaging streams*, by R. W. Carter and Jacob Davidian: USGS--TWRI Book 3, Chapter A6. 1968. 13 pages. \$1.00.
- 3-A7. *Stage measurements at gaging stations*, by T. J. Buchanan and W. P. Somers: USGS--TWRI Book 3, Chapter A7. 1968. 28 pages. \$1.40.
- 3-A8. *Discharge measurements at gaging stations*, by T. J. Buchanan and W. P. Somers: \* USGS--TWRI Book 3, Chapter A8. 1969. 65 pages. \$1.25.
- 3-A11. *Measurement of discharge by moving-boat method*, by G. F. Smoot and C. E. Novak: USGS--TWRI Book 3, Chapter A11. 1969. 22 pages. \$1.20.
- 3-A12. *Fluorometric procedures for dye tracing*, by J. F. Wilson Jr.: USGS--TWRI Book 3, Chapter A12. 1968. 31 pages. \$0.35. Not currently available.
- 3-B1. *Aquifer-test design, observation, and data analysis*, by R. W. Stallman: USGS--TWRI Book 3, Chapter B1. 1971. 26 pages. \$0.70.
- 3-B2. *Introduction to ground-water hydraulics, a programed text for self-instruction*, by G. D. Bennett: USGS--TWRI Book 3, Chapter B2. 1976. 172 pages. \$2.50.
- 3-C1. *Fluvial sediment concepts*, by H. P. Guy: USGS--TWRI Book 3, Chapter C1. 1970. 55 pages. \$2.50.
- 3-C2. *Field methods for measurement of fluvial sediment*, by H. P. Guy and V. W. Norman: USGS--TWRI Book 3, Chapter C2. 1970. 59 pages. \$2.50.
- 3-C3. *Computation of fluvial-sediment discharge*, by George Porterfield: USGS--TWRI Book 3, Chapter C3. 1972. 66 pages. \$2.10.
- 4-A1. *Some statistical tools in hydrology*, by H. C. Riggs: USGS--TWRI Book 4 Chapter A1. 1968. 39 pages. \$1.60.
- 4-A2. *Frequency curves*, by H. C. Riggs: USGS--TWRI Book 4, Chapter A2. 1968. 15 pages. \$1.20
- 4-B1. *Low-flow investigations*, by H. C. Riggs: USGS--TWRI Book 4, Chapter B1. 1972. 18 pages. \$0.65.
- 4-B2. *Storage analyses for water supply*, by H. C. Riggs and C. H. Hardison: USGS--TWRI Book 4, Chapter B2. 1973. 20 pages. \$0.75.
- 4-B3. *Regional analyses of streamflow characteristics*, by H. C. Riggs: USGS--TWRI Book 4, Chapter B3. 1973. 15 pages. \$0.65.
- 4-D1. *Computation of rate and volume of stream depletion by wells*, by C. T. Jenkins: USGS--TWRI Book 4, Chapter D1. 1970. 17 pages. \$1.10.
- 5-A1. *Methods for collection and analysis of water samples for dissolved minerals and gases*, by Eugene Brown, M. W. Skougstad, and M. J. Fishman: USGS--TWRI Book 5, Chapter A1. 1970. 160 pages. \$2.40.
- 5-A2. *Determination of minor elements in water by emission spectroscopy*, by P. R. Barnett and E. C. Mallory, Jr.: USGS--TWRI Book 5, Chapter A2. 1971. 31 pages. \$0.80.
- 5-A3. *Methods for analysis of organic substances in water*, by D. F. Goerlitz and Eugene Brown: USGS--TWRI Book 5, Chapter A3. 1972. 40 pages. \$0.90.
- 5-A4.\* *Methods for collection and analysis of aquatic biological and microbiological samples*, edited by P.E. Greeson, T.A. Ehlike, G.A. Irwin, B.W. Lium, and K.V. Slack: USGS--TWRI Book 5, Chapter A4. 1977. 332 pages. \$20.00.
- 5-A5.\* *Methods for determination of radioactive substances in water and fluvial sediments*, by L.L. Thatcher, V.J. Janzer, and K.W. Edwards: USGS--TWRI Book 5, Chapter A5. 1977. 95 pages. \$16.00.
- 5-C1. *Laboratory theory and methods for sediment analysis*, by H. P. Guy: USGS--TWRI Book 5, Chapter C1. 1969. 58 pages. \$2.10.
- 7-C1. *Finite difference model for aquifer simulation in two dimensions with results of numerical experiments*, by P. C. Trescott, G. F. Pinder, and S. P. Larson: USGS--TWRI Book 7, Chapter C1. 1976. 116 pages. \$2.30.
- 8-A1. *Methods of measuring water levels in deep wells*, by M. S. Garber and F. C. Koopman: USGS--TWRI Book 8, Chapter A1. 1968. 23 pages. \$0.70.
- 8-B2. *Calibration and maintenance of vertical-axis type current meters*, by G. F. Smoot and C. E. Novak: USGS--TWRI Book 8, Chapter B2. 1968. 15 pages. \$1.10.

\*These publications are available ONLY from Superintendent of Documents, Government Printing Office, Washington, D.C. 20402. They are in looseleaf format and are subscription items. Additional supplements will be issued to subscribers at no extra cost. Checks should be made payable to Superintendent of Documents. Requester should emphasize to Superintendent of Documents that this is a subscription item.



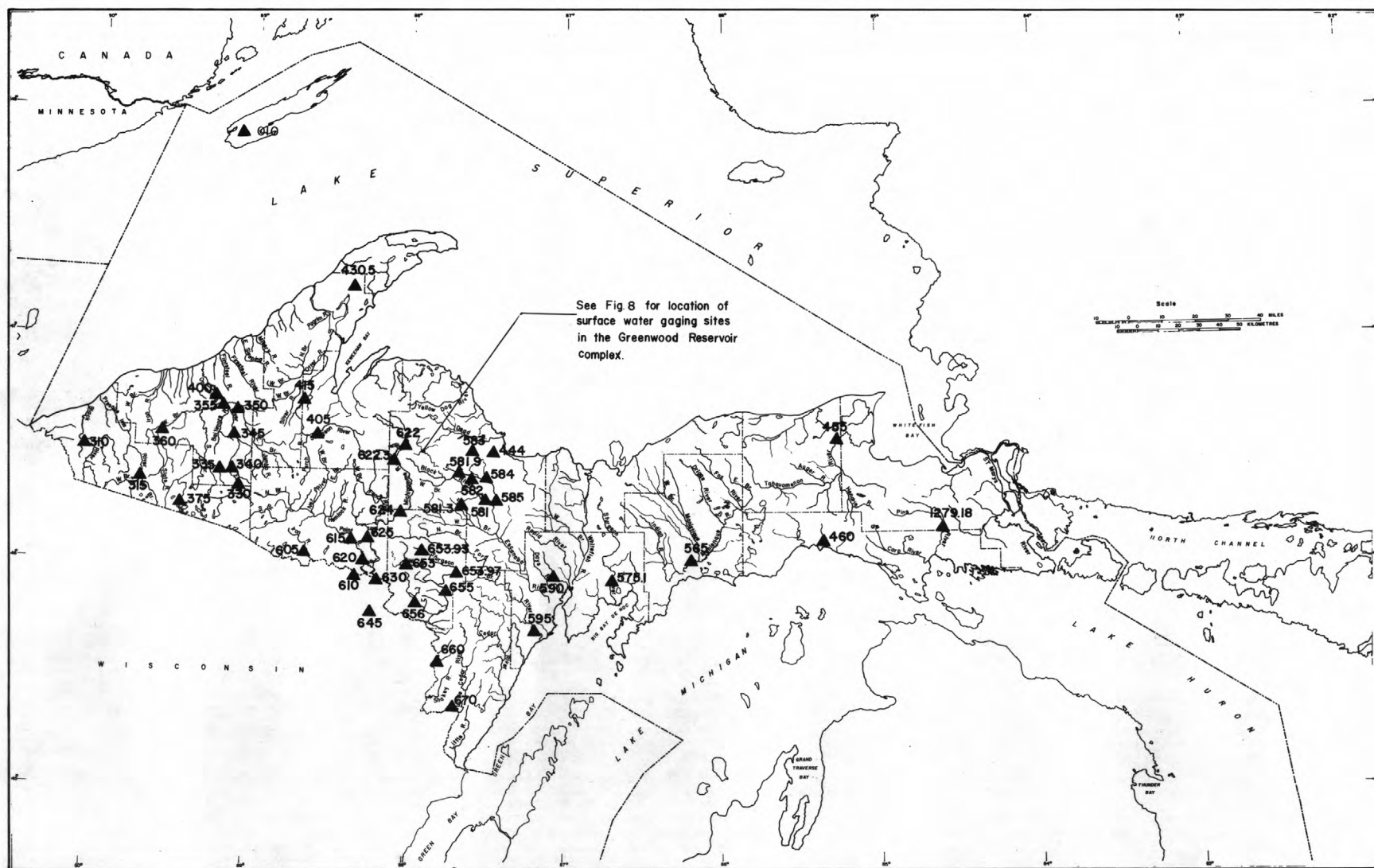


FIGURE 4.--Map showing identification number and location of gaging stations in Upper Peninsula of Michigan.





FIGURE 5.--Map showing identification number and location of gaging stations in Lower Peninsula of Michigan.

FIGURE 6.--Map showing identification number and location of water-quality stations in Upper Peninsula of Michigan.





## STREAMS TRIBUTARY TO LAKE SUPERIOR

04001000 WASHINGTON CREEK AT WINDIGO, MI  
(Hydrologic bench-mark station)

LOCATION.--Lat 47°55'23", long 89°08'42", in NW 1/4 sec.28, T.64 N., R.38 W., Keweenaw County, Isle Royale National Park, Hydrologic Unit 04020300, on left bank 0.8 mi (1.3 km) northeast of Windigo, and 35 mi (56 km) southwest of Rock Harbor.

DRAINAGE AREA.--13.2 mi<sup>2</sup> (34.2 km<sup>2</sup>).

## WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--October 1964 to current year.

GAGE.--Water-stage recorder and concrete control. Altitude of gage is 605 ft (184 m) from topographic map (nearest 5 ft).

REMARKS.--Water-discharge records fair. ERTS satellite telemeter and recording rain gage at station. Capacity rain gage located near mouth. Hydrologic bench-mark station are installed in specially selected areas where water resources have not yet been affected by works of man. Continuous records of natural hydrologic conditions, such as streamflow and water quality, will make possible assessment of changes which occur as a result of changes in climate and other natural factors. These data will provide a frame of reference against which hydrologic changes wrought by man may be evaluated.

AVERAGE DISCHARGE.--14 years, 18.4 ft<sup>3</sup>/s (0.521 m<sup>3</sup>/s), 18.93 in/yr (481 mm/yr).EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 480 ft<sup>3</sup>/s (13.6 m<sup>3</sup>/s) May 1, 1972, gage height, 6.82 ft (2.079 m), from rating curve extended above 160 ft<sup>3</sup>/s (4.53 m<sup>3</sup>/s) based on runoff characteristics of nearby stations; maximum gage height, 6.88 ft (2.097 m) Jan. 13, 1975, backwater from ice; minimum daily discharge, 0.44 ft<sup>3</sup>/s (0.012 m<sup>3</sup>/s) Aug. 25, 1977; minimum gage height, 2.55 ft (0.777 m) Aug. 29, 30, 31, Sept. 2, 3, 7, 9, 10, 11, 12, 1976.EXTREMES FOR CURRENT YEAR.--Peak discharges above base of 110 ft<sup>3</sup>/s (3.12 m<sup>3</sup>/s) and maximum (\*):

Date	Time	Discharge (ft <sup>3</sup> /s) (m <sup>3</sup> /s)	Gage height (ft) (m)	Date	Time	Discharge (ft <sup>3</sup> /s) (m <sup>3</sup> /s)	Gage height (ft) (m)
Apr. 27	2300	118 3.34	4.85 1.478	May 9	1400	*126 3.57	*4.95 1.509

Minimum daily discharge, 1.9 ft<sup>3</sup>/s (0.054 m<sup>3</sup>/s) Aug. 11-14.DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	35	21	15	8.9	4.9	2.2	3.7	58	48	12	4.7	2.8
2	31	18	14	8.6	4.5	2.2	3.5	53	40	11	4.1	2.9
3	29	16	13	7.9	4.3	2.2	3.5	53	35	10	3.5	3.2
4	27	14	12	7.9	4.3	2.1	3.6	54	30	9.4	3.0	4.0
5	28	13	11	7.7	4.2	2.1	4.7	53	26	8.8	2.7	14
6	26	12	13	8.2	4.2	2.1	8.2	52	25	8.9	2.4	15
7	23	12	12	8.4	4.1	2.1	4.8	49	27	18	2.2	10
8	32	12	12	8.4	4.1	2.0	23	56	28	36	2.1	7.4
9	41	11	13	8.2	4.1	2.0	9.0	100	24	34	2.0	6.3
10	36	12	12	8.2	3.9	2.0	8.6	86	24	32	2.0	5.9
11	54	12	11	7.7	3.9	2.1	9.6	66	24	23	1.9	26
12	52	11	11	7.7	3.8	2.1	11	57	20	18	1.9	25
13	43	9.7	11	7.5	3.7	2.2	9.6	49	18	20	1.9	18
14	36	10	10	7.3	3.5	2.4	9.5	48	16	16	1.9	19
15	30	10	10	7.3	3.4	2.5	12	61	15	13	3.9	19
16	26	14	11	7.1	3.3	2.5	15	54	14	10	9.3	14
17	24	16	24	7.1	3.2	2.5	18	46	13	9.1	7.6	11
18	22	15	41	7.7	3.0	2.6	22	41	11	19	5.8	9.7
19	19	13	34	6.6	2.9	2.6	26	36	10	17	4.8	8.2
20	17	31	32	6.6	2.8	2.6	28	36	9.0	14	3.9	7.3
21	17	53	34	6.6	2.7	2.6	30	33	8.6	11	3.2	5.6
22	16	39	29	6.1	2.6	2.6	34	29	8.2	11	2.8	5.9
23	15	30	24	5.5	2.5	2.8	42	27	8.2	13	3.5	5.4
24	14	23	20	5.8	2.5	2.8	52	24	9.0	10	4.0	5.0
25	14	23	17	5.5	2.4	2.8	75	24	11	8.5	3.4	4.6
26	14	19	15	5.5	2.4	2.8	81	32	25	8.2	3.3	4.4
27	14	15	13	5.5	2.3	2.8	89	31	28	7.1	3.2	4.2
28	13	14	12	5.5	2.3	2.9	98	40	22	6.6	3.1	4.1
29	12	14	10	5.5	---	3.0	93	49	17	8.8	3.0	4.3
30	12	14	9.6	5.5	---	3.2	69	64	14	6.9	2.9	4.6
31	14	---	9.4	4.8	---	3.6	---	52	---	5.4	2.9	---
TOTAL	786	526.7	515.0	216.8	95.8	77.0	939.5	1513	608.0	435.7	106.9	279.8
MEAN	25.4	17.6	16.6	6.99	3.42	2.48	31.3	48.8	20.3	14.1	3.45	9.33
MAX	54	53	41	8.9	4.9	3.6	98	100	48	36	9.3	26
MIN	12	9.7	9.4	4.8	2.3	2.0	3.5	24	8.2	5.4	1.9	2.8
CFSM	1.92	1.33	1.26	.53	.26	.19	2.37	3.70	1.54	1.07	.26	.71
IN.	2.21	1.48	1.45	.61	.27	.22	2.65	4.26	1.71	1.23	.30	.79

CAL YR 1977	TOTAL	5185.69	MEAN	14.2	MAX	203	MIN	.44	CFSM	1.08	IN	14.61
WTR YR 1978	TOTAL	6100.20	MEAN	16.7	MAX	100	MIN	1.9	CFSM	1.27	IN	17.19

04001000 WASHINGTON CREEK AT WINDIGO, MI--CONTINUED

## WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water year 1965 to current year.

PERIOD OF DAILY RECORD.--

WATER TEMPERATURES: October 1964 to current year.

INSTRUMENTATION.--Temperature recorder since Oct. 20, 1964.

REMARKS.--Temperature recorder clock stopped Dec. 11 to Jan. 17 (range in temperature 0.0 to 0.5°C), May 9-15 (range in temperature 5.0 to 8.5°C). Complete ice cover during winter period. In addition to the temperature recorder record, samples were collected approximately bimonthly.

EXTREMES FOR PERIOD OF DAILY RECORD.--

WATER TEMPERATURES: Maximum, 22.0°C July 26, 30, 31, 1970, July 18, Aug. 1, 1975, July 20, 1977; minimum, 0.0°C on many days during winter periods.

EXTREMES FOR CURRENT YEAR.--

WATER TEMPERATURES: Maximum, 19.5°C Aug. 14; minimum, 0.0°C on many days during winter period.

## WATER QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DATE	TIME	STREAM- FLOW, INSTAN- TANEOUS (CFS)	SPF- CIFIC CON- DUCT- ANCE (MICRO- MHOS)	PH (UNITS)	TEMPER- ATURE (DEG C)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION)	COLI- FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML)	STREP- TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML)	HARD- NESS (MG/L AS CAC03)
OCT 20...	1130	17	95	7.0	6.0	--	--	K5	--	47
JAN 31...	1400	4.8	125	7.6	.0	--	--	--	31	63
MAR 07...	1300	2.2	145	7.8	.0	10.2	71	K6	<1	75
MAY 16...	1335	56	70	7.0	9.5	10.1	90	K9	K4	32
JUL 13...	1330	22	103	8.0	15.0	8.5	86	--	87	49
SEP 20...	1300	7.5	130	7.4	11.0	9.5	87	K4	--	65

DATE	HARD- NESS, NONCAR- BONATE (MG/L CAC03)	CALCIUM DIS- SOLVED (MG/L AS CA)	MAGNE- SIUM, DIS- SOLVED (MG/L AS MG)	SODIUM, DIS- SOLVED (MG/L AS NA)	SODIUM AD- SORP- TION RATIO	SODIUM PERCENT	POTAS- SIUM, DIS- SOLVED (MG/L AS K)	BICAR- BONATE (MG/L AS HC03)	CAR- BONATE (MG/L AS C03)	ALKA- LITY (MG/L AS CAC03)
OCT 20...	10	13	3.5	2.1	.1	9	.5	45	0	37
JAN 31...	9	17	5.1	3.0	.2	9	.5	66	0	54
MAR 07...	9	20	6.0	3.8	.2	10	.5	80	0	66
MAY 16...	9	8.5	2.5	1.5	.1	9	.5	28	0	23
JUL 13...	10	13	4.0	2.2	.1	9	.4	--	--	39
SEP 20...	15	18	4.8	2.7	.1	8	.5	--	--	50

DATE	CARBON DIOXIDE DIS- SOLVED (MG/L AS C02)	SULFATE DIS- SOLVED (MG/L AS S04)	CHLO- RIDE, DIS- SOLVED (MG/L AS CL)	FLUO- RIDE, DIS- SOLVED (MG/L AS F)	SILICA, DIS- SOLVED (MG/L AS SiO2)	SOLIDS, RESIDUE AT 180 DEG. C DIS- SOLVED (MG/L)	SOLIDS, SUM OF CONSTI- TUENTS, DIS- SOLVED (MG/L)	SOLIDS, DIS- SOLVED (TONS PER DAY)	NITRO- GEN, NO2+NO3 TOTAL (MG/L AS N)	PHOS- PHORUS, TOTAL (MG/L AS P)
OCT 20...	7.2	8.3	1.9	.0	11	87	62	3.99	.01	.01
JAN 31...	2.7	7.2	2.7	.1	14	114	82	1.48	.11	.01
MAR 07...	2.0	6.8	3.5	.0	16	114	96	.68	.14	.01
MAY 16...	4.5	6.7	.3	.0	6.9	68	41	10.3	.04	.06
JUL 13...	--	6.3	2.1	.1	9.4	99	61	5.88	.04	.00
SEP 20...	--	4.6	2.6	.0	11	115	74	2.33	.09	.01

K--RESULTS BASED ON COLONY COUNT OUTSIDE THE ACCEPTABLE RANGE (NON-IDEAL COLONY COUNT)

STREAMS TRIBUTARY TO LAKE SUPERIOR  
04001000 WASHINGTON CREEK AT WINDIGO, MI--CONTINUED

## WATER-QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978--CONTINUED

DATE	TIME	ARSENIC TOTAL (UG/L AS AS)	BARIUM, TOTAL RECOV- ERABLE (UG/L AS BA)	CADMIUM TOTAL RECOV- ERABLE (UG/L AS CD)	CHRO- MIUM, TOTAL RECOV- ERABLE (UG/L AS CR)	COPPER, TOTAL RECOV- ERABLE (UG/L AS CU)	IRON, TOTAL RECOV- ERABLE (UG/L AS FE)
OCT 20...	1130	0	0	0	10	3	470
MAY 16...	1335	0	0	1	10	1	510

DATE	LEAD, TOTAL RECOV- ERABLE (UG/L AS PB)	MANGA- NESE, TOTAL RECOV- ERABLE (UG/L AS MN)	MERCURY TOTAL RECOV- ERABLE (UG/L AS HG)	SELE- NIUM, TOTAL (UG/L AS SE)	SILVER, TOTAL RECOV- ERABLE (UG/L AS AG)	ZINC, TOTAL RECOV- ERABLE (UG/L AS ZN)
OCT 20...	3	20	<.5	0	0	10
MAY 16...	14	20	<.5	0	0	10

## RADIOCHEMICAL ANALYSES

DATE	TIME	GROSS ALPHA, DIS- SOLVED (UG/L AS U-NAT)	GROSS ALPHA, SUSP. TOTAL (UG/L AS U-NAT)	GROSS BETA, DIS- SOLVED (PCI/L AS CS-137)	GROSS BETA, SUSP. TOTAL (PCI/L AS CS-137)	GROSS BETA, DIS- SOLVED (PCI/L AS SR/ YT-90)	GROSS BETA, SUSP. TOTAL (PCI/L AS SR/ YT-90)	RADIUM 226, DIS- SOLVED, RADON METHOD (PCI/L)	URANIUM DIS- SOLVED, EXTRAC- TION (UG/L)
OCT 20...	1130	<1.4	<.4	2.7	<.4	2.1	<.4	.13	<.01

## PESTICIDE ANALYSES

DATE	TIME	PCB, TOTAL (UG/L)	ALDRIN, TOTAL (UG/L)	ALDRIN, TOTAL IN BOT- TOM MA- TERIAL (UG/KG)	CHLOR- DANE, TOTAL (UG/L)	CHLOR- DANE, TOTAL IN BOT- TOM MA- TERIAL (UG/KG)	DDD, TOTAL (UG/L)	DDD, TOTAL IN BOT- TOM MA- TERIAL (UG/KG)	DDE, TOTAL (UG/L)	DDE, TOTAL IN BOT- TOM MA- TERIAL (UG/KG)	DDT, TOTAL (UG/L)	DDT, TOTAL IN BOT- TOM MA- TERIAL (UG/KG)
OCT 20...	1130	.0	.00	.0	.0	0	.00	.0	.00	.0	.00	.0

DATE	DI- AZINON, TOTAL (UG/L)	DI- ELDRIN TOTAL (UG/L)	DI- ELDRIN, TOTAL IN BOT- TOM MA- TERIAL (UG/KG)	ENDRIN, TOTAL (UG/L)	ENDRIN, TOTAL IN BOT- TOM MA- TERIAL (UG/KG)	ETHION, TOTAL (UG/L)	HEPTA- CHLOR, TOTAL (UG/L)	HEPTA- CHLOR, TOTAL IN BOT- TOM MA- TERIAL (UG/KG)	HEPTA- CHLOR EPOXIDE TOT. IN BOTTOM MATL. (UG/KG)	LINDANE TOTAL (UG/L)
OCT 20...	.00	.00	.0	.00	.0	.00	.00	.0	.00	.0

DATE	LINDANE TOTAL IN BOT- TOM MA- TERIAL (UG/KG)	MALA- THION, TOTAL (UG/L)	METHYL PARA- THION, TOTAL (UG/L)	METHYL TRI- THION, TOTAL (UG/L)	PARA- THION, TOTAL (UG/L)	TOX- APHENE, TOTAL (UG/L)	TOXA- PHENE, TOTAL IN BOT- TOM MA- TERIAL (UG/KG)	TOTAL TRI- THION (UG/L)	2,4-D, TOTAL (UG/L)	2,4,5-T TOTAL (UG/L)	SILVEX, TOTAL (UG/L)
OCT 20...	.0	.00	.00	.00	.00	0	0	.00	.00	.00	.00



## 04001000 WASHINGTON CREEK AT WINDIGO, MI--CONTINUED

TEMPERATURE (DEG. C) OF WATER, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DAY	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN
	OCTOBER		NOVEMBER		DECEMBER		JANUARY		FEBRUARY		MARCH	
1	11.0	10.0	6.5	6.0	1.5	1.5	---	---	.0	.0	.0	.0
2	10.0	9.0	6.5	6.0	1.5	1.5	---	---	.0	.0	.0	.0
3	9.5	8.5	6.0	6.0	1.5	1.5	---	---	.0	.0	.0	.0
4	9.0	8.0	6.0	5.0	1.5	1.5	---	---	.0	.0	.0	.0
5	8.5	8.5	5.0	4.5	1.5	1.5	---	---	.0	.0	.0	.0
6	8.5	8.0	4.5	4.0	1.5	1.5	---	---	.0	.0	.0	.0
7	8.0	7.5	5.0	4.5	1.5	1.5	---	---	.0	.0	.0	.0
8	7.5	7.5	6.5	5.5	1.5	1.5	---	---	.0	.0	.0	.0
9	7.5	7.5	7.5	6.5	1.5	1.5	---	---	.0	.0	.0	.0
10	7.5	7.0	7.5	5.0	1.5	1.5	---	---	.0	.0	.0	.0
11	7.0	7.0	5.0	3.0	---	---	---	---	.0	.0	.0	.0
12	7.0	6.5	3.0	2.5	---	---	---	---	.0	.0	.0	.0
13	6.5	6.0	2.5	2.5	---	---	---	---	.0	.0	.5	.5
14	7.5	6.5	3.0	2.5	---	---	---	---	.0	.0	.5	.5
15	7.5	7.0	3.0	3.0	---	---	---	---	.0	.0	.5	.5
16	7.0	6.5	3.0	3.0	---	---	---	---	.0	.0	.5	.5
17	6.5	6.0	3.0	3.0	---	---	---	---	.0	.0	.5	.5
18	6.5	6.5	3.0	3.0	---	---	.0	.0	.0	.0	.5	.5
19	6.5	6.0	3.0	2.5	---	---	.5	.0	.0	.0	.5	.5
20	6.5	5.5	2.0	1.5	---	---	.5	.5	.0	.0	.5	.5
21	6.5	6.5	1.5	1.5	---	---	.5	.0	.0	.0	.5	.5
22	6.5	6.0	1.5	1.5	---	---	.0	.0	.0	.0	.5	.5
23	6.0	5.0	1.5	1.5	---	---	.0	.0	.0	.0	.5	.5
24	5.5	5.0	1.5	1.5	---	---	.0	.0	.0	.0	.5	.5
25	6.5	5.5	1.5	1.5	---	---	.0	.0	.0	.0	1.0	1.0
26	7.0	6.5	1.5	1.5	---	---	.0	.0	.0	.0	1.0	1.0
27	7.0	7.0	1.5	1.5	---	---	.0	.0	.0	.0	1.0	1.0
28	7.0	6.0	1.5	1.5	---	---	.0	.0	.0	.0	1.0	1.0
29	6.0	5.5	1.5	1.5	---	---	.0	.0	---	---	1.0	1.0
30	6.0	5.0	1.5	1.5	---	---	.0	.0	---	---	1.0	1.0
31	6.5	6.5	---	---	---	---	.0	.0	---	---	1.0	1.0
MONTH	11.0	5.0	7.5	1.5					.0	.0	1.0	.0

DAY	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN
	APRIL		MAY		JUNE		JULY		AUGUST		SEPTEMBER	
1	1.0	1.0	4.5	3.5	12.5	11.0	18.0	16.0	16.0	13.0	13.0	12.0
2	1.0	1.0	4.5	4.0	12.5	11.0	18.0	16.5	16.0	15.0	15.0	13.0
3	1.0	1.0	5.5	4.5	13.0	11.0	17.5	14.5	15.0	13.0	15.0	13.5
4	1.0	1.0	6.0	5.0	13.0	12.0	18.0	15.5	15.0	13.0	14.0	13.0
5	1.0	1.0	6.5	5.0	14.5	11.5	17.5	17.0	16.0	14.0	14.0	12.5
6	1.5	1.5	7.0	5.5	15.0	12.5	18.0	17.0	16.0	13.5	14.5	13.5
7	1.5	1.5	7.5	5.5	14.5	11.0	18.0	15.0	16.0	13.0	14.5	13.0
8	1.5	1.5	6.5	6.0	12.0	10.0	16.5	14.0	18.0	15.5	13.0	12.5
9	1.5	1.5	---	---	12.0	10.0	16.5	14.5	17.0	14.5	13.0	12.5
10	1.5	1.5	---	---	13.5	10.5	15.0	13.0	16.0	13.5	13.5	13.0
11	1.5	1.5	---	---	15.5	13.0	16.0	13.0	16.0	14.5	13.5	12.5
12	1.5	1.5	---	---	15.0	13.0	15.5	14.0	16.5	15.0	12.5	11.0
13	1.5	1.5	---	---	13.5	11.0	16.5	14.0	17.5	16.0	11.0	10.5
14	1.5	1.5	---	---	13.0	10.5	16.5	14.5	19.5	17.0	11.0	10.5
15	1.5	1.5	---	---	13.0	12.0	16.5	14.5	19.0	18.0	11.5	11.0
16	1.5	1.5	12.0	8.0	14.5	12.0	17.0	14.5	18.0	16.0	11.5	10.5
17	2.0	2.0	13.5	10.5	15.0	13.5	18.5	15.5	16.0	15.5	11.0	10.5
18	2.0	2.0	14.5	11.0	16.0	13.0	19.0	17.0	17.0	16.0	11.0	10.5
19	2.0	2.0	14.0	12.0	17.0	12.5	18.5	17.0	16.0	15.0	11.5	11.0
20	2.0	2.0	14.0	11.5	17.0	15.0	17.5	16.5	15.0	12.5	11.5	11.0
21	2.0	2.0	12.5	9.5	15.0	14.0	17.0	15.0	16.5	14.5	11.5	10.0
22	2.0	2.0	13.5	9.5	15.0	12.0	15.5	14.5	16.5	15.5	10.5	9.0
23	2.0	2.0	14.5	10.5	16.0	13.0	15.0	14.0	16.0	13.5	11.0	10.0
24	2.0	2.0	15.5	11.5	15.5	14.5	17.0	14.5	13.5	13.0	11.5	11.0
25	2.0	2.0	15.0	13.0	16.0	14.5	18.5	16.5	14.0	13.0	11.5	9.5
26	2.5	2.0	17.0	13.0	16.5	14.0	18.5	16.5	14.0	13.5	11.0	10.0
27	3.0	2.5	18.5	15.0	17.0	15.0	18.5	16.5	14.0	13.5	11.0	9.5
28	3.5	2.5	18.0	15.5	18.0	15.0	16.5	14.5	15.0	13.5	10.0	9.0
29	4.0	3.5	16.0	15.0	19.0	16.0	15.5	14.5	15.0	13.5	9.5	9.5
30	4.0	3.5	15.5	14.0	18.5	17.0	15.0	13.0	14.5	12.0	10.5	9.5
31	---	---	14.5	12.5	---	---	15.0	14.0	12.5	10.5	---	---
ONTH	4.0	1.0			19.0	10.0	19.0	13.0	19.5	10.5	15.0	9.0

## STREAMS TRIBUTARY TO LAKE SUPERIOR

04031000 BLACK RIVER NEAR BESSEMER, MI

LOCATION.--Lat 46°30'41", long 90°04'28", in NE¼ SE¼ sec.32, T.48 N., R.46 W., Gogebic County, Hydrologic Unit 04020101, on right bank 450 ft (137 m) downstream from bridge on county highway, 500 ft (152 m) downstream from Powder Mill Creek, and 2.5 mi (4.0 km) northwest of Bessemer.

DRAINAGE AREA.--200 mi<sup>2</sup> (518 km<sup>2</sup>).

PERIOD OF RECORD.--October 1954 to current year.

REVISED RECORDS.--WSP 1911: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 1,154.3 ft (351.83 m) National Geodetic Vertical Datum of 1929 (levels by registered surveyor).

REMARKS.--Records good except those for the winter period, which are fair. Prior to 1967, flow included some ground water pumped from mines at Bessemer. Several observations of water temperature were made during the year.

AVERAGE DISCHARGE.--24 years, 235 ft<sup>3</sup>/s (6.655 m<sup>3</sup>/s), 15.96 in/yr (405 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 14,800 ft<sup>3</sup>/s (419 m<sup>3</sup>/s) Apr. 24, 1960, gage height, 14.27 ft (4.349 m), from flood-mark, from rating curve extended above 5,300 ft<sup>3</sup>/s (150 m<sup>3</sup>/s) on basis of slope-area measurement of peak flow; minimum daily, 6.8 ft<sup>3</sup>/s (0.19 m<sup>3</sup>/s) Sept. 25, Oct. 1-3, 1976; minimum gage height, 0.36 ft (0.110 m) Sept. 9, 1970.

EXTREMES FOR CURRENT YEAR.--Peak discharges above base of 1,500 ft<sup>3</sup>/s (42.5 m<sup>3</sup>/s) and maximum (\*):

Date	Time	Discharge (ft <sup>3</sup> /s) (m <sup>3</sup> /s)	Gage height (ft) (m)	Date	Time	Discharge (ft <sup>3</sup> /s) (m <sup>3</sup> /s)	Gage height (ft) (m)
Oct. 12	0700	*2360 66.8	*6.34 1.932	Apr. 17	2400	1520 43.0	4.91 1.497
Apr. 9	2200	1870 53.0	5.54 1.689	May 30	1000	1720 48.7	5.28 1.609

Minimum discharge, 23 ft<sup>3</sup>/s (0.65 m<sup>3</sup>/s) Aug. 10, 12, gage height, 0.61 ft (0.186 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	402	161	215	110	64	45	495	432	985	31	62	129
2	339	151	200	105	64	44	482	366	856	45	68	97
3	276	144	180	105	64	44	422	311	663	54	66	69
4	238	132	170	100	64	43	526	267	506	59	56	43
5	236	124	160	96	64	44	695	230	395	65	49	47
6	209	118	150	94	64	44	1050	201	303	65	43	41
7	187	127	140	91	64	44	1340	178	248	108	38	36
8	488	128	135	89	64	44	1220	210	284	165	33	34
9	856	127	130	87	64	44	1460	417	231	133	28	32
10	740	138	130	86	64	44	1740	517	191	117	25	31
11	1280	147	125	84	64	44	1430	469	160	89	24	31
12	2270	139	120	82	64	44	1230	382	140	74	25	46
13	1830	129	120	80	63	45	1260	298	117	86	31	56
14	1280	125	120	78	62	45	1040	293	109	64	30	76
15	955	133	120	76	61	45	1000	334	116	52	35	79
16	749	196	120	75	60	46	1100	307	149	42	41	71
17	607	209	130	74	58	46	1270	250	153	38	42	69
18	561	203	140	73	57	47	1450	207	128	124	40	62
19	510	188	150	71	57	49	1470	176	104	106	34	59
20	426	466	150	70	56	52	1360	159	89	103	29	54
21	357	819	150	69	55	55	1120	135	72	80	27	51
22	302	613	140	68	54	57	1040	118	60	85	26	45
23	260	483	140	68	52	60	1080	99	52	158	638	42
24	232	440	135	68	50	64	1060	84	44	127	774	38
25	217	400	135	67	48	70	1070	124	45	133	608	34
26	202	350	130	67	47	80	945	164	44	174	522	36
27	189	310	125	66	46	100	824	184	42	152	427	41
28	177	285	120	66	45	130	728	392	39	121	355	34
29	162	260	115	65	---	175	630	769	35	105	271	34
30	150	230	115	65	---	213	529	1530	30	86	202	39
31	151	---	110	64	---	302	---	1090	---	73	155	---
TOTAL	16838	7475	4320	2459	1639	2209	31066	10693	6395	2914	4804	1566
MEAN	543	249	139	79.3	58.5	71.3	1036	345	213	94.0	155	52.2
MAX	2270	819	215	110	64	302	1740	1530	985	174	774	129
MIN	150	118	110	64	45	43	422	84	30	31	24	31
CFSM	2.72	1.25	.70	.40	.29	.36	5.18	1.73	1.07	.47	.78	.26
IN.	3.13	1.39	.80	.46	.30	.41	5.78	1.99	1.19	.54	.89	.29
CAL YR 1977	TOTAL	87940	MEAN	241	MAX	2270	MIN	11	CFSM	1.21	IN	16.36
WTR YR 1978	TOTAL	92378	MEAN	253	MAX	2270	MIN	24	CFSM	1.27	IN	17.18

STREAMS TRIBUTARY TO LAKE SUPERIOR

25

04031500 PRESQUE ISLE RIVER AT MARENISCO, MI

LOCATION.--Lat 46°22'20", long 89°41'32", in SE¼ NW¼ sec.21, T.46 N., R.43 W., Gogebic County, Hydrologic Unit 04020101, on left bank 0.3 mi (0.5 km) upstream from highway bridge in Marenisco, and 1.5 mi (2.4 km) downstream from confluence of East and West Branches.

DRAINAGE AREA.--171 mi<sup>2</sup> (443 km<sup>2</sup>).

PERIOD OF RECORD.--February 1945 to current year.

REVISED RECORDS.--WSP 1707: 1954. WSP 1911: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 1,489.30 ft (453.939 m) National Geodetic Vertical Datum of 1929 (levels by Michigan Department of Natural Resources). Prior to May 27, 1949, nonrecording gage at site 0.3 mi (0.5 km) downstream at different datum.

REMARKS.--Records good except those for the winter period, which are fair. Occasional regulation for lake or pond level control at several locations in the headwaters. Since 1959, occasional regulation by Presque Isle Flooding Reservoir, usable capacity, about 3,000 acre-ft (3.7 hm<sup>3</sup>), 2.5 mi (4.0 km) upstream. Several observations of water temperature were made during the year.

AVERAGE DISCHARGE.--33 years, 177 ft<sup>3</sup>/s (5.013 m<sup>3</sup>/s), 14.06 in/yr (357 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 3,520 ft<sup>3</sup>/s (99.7 m<sup>3</sup>/s) Apr. 25, 1960, gage height, 11.25 ft (3.429 m); minimum observed, 13 ft<sup>3</sup>/s (0.37 m<sup>3</sup>/s) Sept. 30, 1948, gage height, 2.25 ft (0.686 m), site and datum then in use.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 1,180 ft<sup>3</sup>/s (33.4 m<sup>3</sup>/s) Aug. 25, gage height, 7.60 ft (2.316 m); minimum, 69 ft<sup>3</sup>/s (1.95 m<sup>3</sup>/s) Aug. 14, gage height, 3.65 ft (1.113 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	253	171	140	120	98	92	181	283	981	104	99	229
2	236	172	140	115	98	92	160	229	784	148	159	207
3	211	164	140	110	98	92	152	229	696	177	195	188
4	181	155	135	110	98	92	183	218	586	166	166	180
5	185	150	130	105	98	92	206	200	351	158	137	173
6	174	145	130	105	98	92	251	191	258	147	116	167
7	168	153	130	105	98	92	310	181	266	133	104	145
8	226	159	130	105	98	92	306	187	335	137	95	138
9	330	157	125	105	98	92	370	252	322	123	87	138
10	339	163	125	105	96	92	485	298	298	120	81	132
11	479	174	125	105	96	92	502	286	274	111	97	131
12	650	167	125	100	96	92	494	257	219	102	90	143
13	723	159	125	100	96	92	530	242	195	100	76	178
14	678	141	125	100	96	92	497	275	193	92	73	222
15	566	133	120	100	96	92	451	280	207	85	83	224
16	485	150	125	100	96	92	446	254	219	82	130	196
17	361	150	125	100	96	92	459	238	215	79	135	180
18	310	146	130	100	96	92	488	215	219	101	122	155
19	305	139	140	100	96	92	510	195	224	178	110	147
20	292	168	145	100	96	92	515	180	221	163	98	142
21	271	221	145	100	96	94	497	163	191	144	90	138
22	250	265	145	100	96	94	467	130	148	139	84	129
23	235	265	145	100	96	96	449	119	127	189	503	125
24	223	194	140	100	96	96	446	117	123	204	1030	113
25	216	180	135	100	94	96	449	119	121	289	1150	107
26	166	170	130	100	94	96	438	143	122	333	951	108
27	110	160	130	98	92	96	412	177	117	284	758	95
28	143	150	130	98	92	96	386	254	108	238	560	92
29	153	150	125	98	---	98	361	783	102	202	445	97
30	149	145	120	98	---	110	333	1090	101	176	333	98
31	151	---	120	98	---	153	---	1130	---	119	260	---
TOTAL	9219	5016	4075	3180	2694	2965	11734	8915	8323	4823	8417	4517
MEAN	297	167	131	103	96.2	95.6	391	288	277	156	272	141
MAX	723	265	145	120	98	153	530	1130	981	333	1150	229
MIN	110	133	120	98	92	92	152	117	101	79	73	92
CFSM	1.74	.98	.77	.60	.56	.56	2.29	1.68	1.62	.91	1.59	.88
IN.	2.01	1.09	.89	.69	.59	.65	2.55	1.94	1.81	1.05	1.83	.98
CAL YR 1977	TOTAL	53980	MEAN 148	MAX 723	MIN 25	CFSM .87	IN 11.74					
WTR YR 1978	TOTAL	73878	MEAN 202	MAX 1150	MIN 73	CFSM 1.18	IN 16.07					



## STREAMS TRIBUTARY TO LAKE SUPERIOR

04033000 MIDDLE BRANCH ONTONAGON RIVER NEAR PAULDING, MI

LOCATION.--Lat 46°21'25", long 89°04'38", in SE¼ NE¼ sec.29, T.46 N., R.38 W., Ontonagon County, Hydrologic Unit 0402102, Ottawa National Forest, on right bank 25 ft (8 m) downstream from bridge on Forest Service Road 172, 2.4 mi (3.9 km) upstream from Bond Falls Reservoir, and 5.7 mi (9.2 km) southeast of Paulding.

DRAINAGE AREA.--164 mi<sup>2</sup> (425 km<sup>2</sup>).

PERIOD OF RECORD.--June 1942 to current year. Monthly discharge only for some periods, published in WSP 1307.

REVISED RECORDS.--WSP 1911: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 1,485.66 ft (452.829 m) National Geodetic Vertical Datum of 1929 (levels by Michigan Department of Natural Resources). Prior to Sept. 28, 1942, nonrecording gage at same site and datum.

REMARKS.--Records good except those for the winter period, which are fair. Several observations of water temperature were made during the year.

AVERAGE DISCHARGE.--36 years, 172 ft<sup>3</sup>/s (4.871 m<sup>3</sup>/s), 14.24 in/yr (362 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 2,050 ft<sup>3</sup>/s (58.1 m<sup>3</sup>/s) Apr. 30, 1951, gage height, 10.0 ft (3.048 m), from high-water mark; minimum, 27 ft<sup>3</sup>/s (0.76 m<sup>3</sup>/s) Nov. 22, 1946, result of freezeup; minimum gage height, 2.96 ft (0.902 m) Nov. 26, 1942, result of freezeup.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 688 ft<sup>3</sup>/s (19.5 m<sup>3</sup>/s) Aug. 25, gage height, 6.63 ft (2.021 m); minimum, 95 ft<sup>3</sup>/s (2.69 m<sup>3</sup>/s) Aug. 14, 15, gage height, 3.57 ft (1.088 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	210	147	145	130	105	96	127	241	442	120	122	343
2	193	144	150	125	105	96	123	217	371	125	172	290
3	176	142	150	125	105	96	118	203	313	131	213	253
4	166	138	145	120	105	96	129	191	271	127	205	223
5	160	134	140	120	105	96	153	178	241	122	176	205
6	154	131	135	120	105	96	170	171	214	121	152	189
7	147	152	130	115	105	96	191	163	196	121	138	176
8	170	181	130	115	105	96	194	162	208	132	126	168
9	218	172	125	115	105	96	206	176	196	132	115	157
10	220	168	125	110	105	96	235	181	178	127	109	151
11	266	164	120	110	105	96	245	171	177	120	104	166
12	314	154	120	110	105	96	240	166	200	113	102	189
13	328	147	120	105	105	96	248	162	181	112	100	209
14	308	145	125	105	105	96	235	218	164	109	98	250
15	273	142	130	105	100	96	221	257	156	106	108	269
16	240	147	130	105	100	96	234	235	151	103	200	237
17	220	148	140	105	100	96	257	212	155	101	255	209
18	218	144	145	105	100	96	292	192	192	119	243	197
19	215	140	150	100	100	96	320	176	169	138	233	191
20	204	141	155	100	100	96	337	165	147	163	221	179
21	192	157	155	100	100	96	336	155	144	145	199	167
22	180	143	155	100	100	96	324	147	133	135	174	156
23	172	230	150	100	100	98	325	142	125	150	309	147
24	166	202	150	100	100	98	334	137	122	150	581	140
25	158	195	145	100	100	100	346	138	118	144	661	135
26	150	170	140	105	100	100	348	156	120	161	647	131
27	152	160	140	105	98	100	336	192	117	158	541	143
28	150	150	135	105	98	105	321	308	112	145	546	135
29	147	150	130	105	---	110	299	327	116	138	525	138
30	143	145	130	105	---	114	268	443	122	133	488	147
31	143	---	130	105	---	116	---	466	---	127	416	---
TOTAL	6159	4684	4270	3375	2866	3053	7512	6448	5551	4028	8279	5690
MEAN	199	156	138	109	102	98.5	250	208	185	130	267	190
MAX	328	230	155	130	105	116	348	466	442	163	661	343
MIN	143	131	120	100	98	96	118	137	112	101	98	131
CFSM	1.21	.95	.84	.67	.62	.60	1.52	1.27	1.13	.79	1.63	1.16
IN.	1.40	1.06	.97	.77	.65	.69	1.70	1.46	1.26	.91	1.88	1.29

CAL YR 1977 TOTAL 52097 MEAN 143 MAX 358 MIN 74 CFSM .87 IN 11.82  
WTR YR 1978 TOTAL 61915 MEAN 170 MAX 661 MIN 96 CFSM 1.04 IN 14.04

## STREAMS TRIBUTARY TO LAKE SUPERIOR

27

04033500 BOND FALLS CANAL NEAR PAULDING, MI

LOCATION.--Lat 46°23'57", long 89°08'47", in SW¼ NE¼ sec.11, T.46 N., R.39 W., Ontonagon County, Hydrologic Unit 04020102, on left bank 40 ft (12 m) upstream from intake to pipeline No. 2, 0.8 mi (1.3 km) downstream from Bond Falls Reservoir on Middle Branch Ontonagon River, and 1.6 mi (2.6 km) east of Paulding.

PERIOD OF RECORD.--July 1942 to current year.

GAGE.--Water-stage recorder and concrete control. Datum of gage is 1,441.59 ft (439.397 m) National Geodetic Vertical Datum of 1929. Prior to Oct. 1, 1968, nonrecording gage at datum 3.00 ft (0.914 m) higher.

REMARKS.--Records good except those below 10 ft<sup>3</sup>/s (0.28 m<sup>3</sup>/s), which are poor. Canal diverts water from Bond Falls Reservoir (station 04034000) to South Branch Ontonagon River; water is used for power production at Victoria Dam near Rockland. Several observations of water temperature were made during the year.

AVERAGE DISCHARGE.--36 years, 138 ft<sup>3</sup>/s (3.908 m<sup>3</sup>/s).

EXTREMES FOR PERIOD OF RECORD.--Maximum daily discharge, 368 ft<sup>3</sup>/s (10.4 m<sup>3</sup>/s) May 5, 1960; no flow at times each year since 1961; minimum gage height observed, -0.03 ft (-0.009 m) Apr. 17, 1963, present datum (two drain holes in weir open and canal gate closed).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	212	197	186	180	282	291	6.8	1.6	10	173	230	23
2	263	244	185	180	280	287	5.2	1.2	10	173	231	23
3	262	271	234	180	275	282	4.5	1.1	10	172	231	23
4	199	287	287	180	275	277	4.5	.02	11	172	231	23
5	155	306	285	250	275	270	3.4	.02	10	170	231	102
6	153	306	285	287	270	262	2.4	.02	10	170	231	167
7	153	306	283	285	270	258	1.8	.02	10	170	230	214
8	153	305	280	282	275	262	1.5	.02	10	170	228	258
9	153	305	278	278	275	244	1.8	.02	10	170	228	258
10	153	303	275	270	275	207	1.5	.02	10	170	226	256
11	153	303	266	270	280	186	1.2	.02	11	169	226	256
12	220	301	278	270	280	184	1.2	.02	11	169	225	254
13	301	301	278	270	280	183	1.0	.02	12	169	223	254
14	301	299	251	270	280	180	1.0	1.0	15	169	223	275
15	301	299	228	270	280	153	1.0	1.2	19	169	223	299
16	301	297	228	270	280	133	.80	1.2	20	169	222	301
17	261	297	226	270	280	122	.80	1.2	21	198	179	299
18	179	256	226	270	275	113	.60	1.2	20	226	186	299
19	177	158	125	270	275	113	.80	1.2	42	225	223	297
20	177	89	44	270	275	113	.60	2.1	103	225	223	297
21	177	67	44	270	275	113	.80	3.0	174	225	223	296
22	177	32	44	270	275	112	.80	3.8	174	223	223	296
23	177	83	44	270	280	112	.80	5.2	174	217	121	294
24	177	174	61	290	280	112	3.3	5.6	174	218	21	292
25	177	173	84	290	280	112	4.4	7.2	174	222	21	290
26	177	239	84	287	285	112	3.2	7.6	173	225	21	290
27	177	323	135	283	296	112	1.6	9.0	173	225	21	289
28	177	313	248	249	296	112	1.5	9.0	173	155	21	289
29	176	301	292	218	---	110	1.7	9.5	173	86	21	287
30	176	248	264	222	---	112	1.5	9.5	173	76	22	278
31	176	---	200	259	---	41	---	10	---	155	22	---
TOTAL	6171	7383	6228	7980	7804	5280	62.00	92.60	2110	5625	5187	7079
MEAN	199	246	201	257	279	170	2.07	2.99	70.3	181	167	236
MAX	301	323	292	290	296	291	6.8	10	174	226	231	301
MTN	153	32	44	180	270	41	.60	.02	10	76	21	23
CAL YR 1977 TOTAL	33675.60			MEAN 92.3	MAX 323	MIN .80						
WTR YR 1978 TOTAL	61001.60			MEAN 167	MAX 323	MIN .02						

## STREAMS TRIBUTARY TO LAKE SUPERIOR

04034000 BOND FALLS RESERVOIR NEAR PAULDING, MI

LOCATION.--Lat 46°24'29", long 89°07'42", in SW¼ sec.1, T.46 N., R.39 W., Ontonagon County, Hydrologic Unit 04020102, at Bond Falls Dam on Middle Branch Ontonagon River, 2.5 mi (4.0 km) east of Paulding.

DRAINAGE AREA.--190 mi<sup>2</sup> (492 km<sup>2</sup>).

PERIOD OF RECORD.--June 1942 to current year. Prior to October 1950, monthend contents only published in WSP 1307.

REVISED RECORDS.--WSP 1911: Drainage area.

GAGE.--Nonrecording gage read once daily. Datum of gage is 1,335.59 ft (407.088 m) National Geodetic Vertical Datum of 1929.

REMARKS.--Reservoir is formed by earthfill and concrete dam with one taintor gate; dam completed 1937. Usuable capacity, 39,720 acre-ft (49.0 hm<sup>3</sup>) between gage heights of 120 ft (36.6 m) (maximum drawdown) and 141 ft (43.0 m) (full pond). Dead storage unknown. Water diverted to South Branch Ontonagon River through Bond Falls Canal (station 04033500); water used for power production at Victoria Dam near Rockland.

COOPERATION.--Gage-height record furnished by Upper Peninsula Power Co. and converted to acre-feet by Geological Survey.

EXTREMES FOR PERIOD OF RECORD (SINCE 1947).--Maximum contents observed, 42,980 acre-ft (53.0 hm<sup>3</sup>) July 3, 1953, gage height, 141.7 ft (43.19 m), of which 1,680 acre-ft (2.07 hm<sup>3</sup>) was uncontrolled storage; minimum, no usable storage at times; minimum gage height observed, 116.0 ft (35.36 m) Mar. 21, 1970.

EXTREMES FOR CURRENT YEAR.--Maximum contents, 38,900 acre-ft (48.0 hm<sup>3</sup>) Oct. 1, gage height, 140.0 ft (42.67 m); no usable storage Mar. 4 to Apr. 10; minimum gage height, 117.4 ft (35.78 m) Mar. 29-31.

## MONTHEND GAGE HEIGHT AND CONTENTS AT 0930, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

Date	Gage height (feet)	Contents (acre-feet)	Change in contents (acre- feet)	Change in contents (equivalent in ft <sup>3</sup> /s)
Sept. 30 . . . . .	140.0	38900	--	--
Oct. 31 . . . . .	139.3	37290	-1610	-26.2
Nov. 30 . . . . .	136.0	29800	-7490	-126
Dec. 31 . . . . .	133.2	23900	-5900	-96.0
CAL YR 1977 . . . . .	--	--	+14800	+20.4
Jan. 31 . . . . .	127.6	13040	-10860	-177
Feb. 28 . . . . .	121.0	1500	-11540	-208
Mar. 31 . . . . .	117.4	0	-1500	-24.4
Apr. 30 . . . . .	127.5	12850	+12850	+216
May 31 . . . . .	133.6	24700	+11850	+193
June 30 . . . . .	135.8	29360	+4660	+78.3
July 31 . . . . .	133.4	24300	-5060	-82.3
Aug. 31 . . . . .	135.8	29360	+5060	+82.3
Sept. 30 . . . . .	134.6	26760	-2600	-43.7
WTR YR 1978 . . . . .	--	--	-12140	-16.8



## STREAMS TRIBUTARY TO LAKE SUPERIOR

29

## 04034500 MIDDLE BRANCH ONTONAGON RIVER NEAR TROUT CREEK, MI

LOCATION.--Lat 46°28'40", long 89°05'25", in SW 1/4 sec.8, T.47 N., R.38 W., Ontonagon County, Hydrologic Unit 04020102, on right bank 0.1 mi (0.2 km) upstream from State Highway 28, 3.8 mi (6.1 km) west of village of Trout Creek, and 7.5 mi (12.1 km) downstream from Bond Falls Reservoir.

DRAINAGE AREA.--203 mi<sup>2</sup> (526 km<sup>2</sup>).

PERIOD OF RECORD.--June 1942 to current year.

REVISED RECORDS.--WSP 1911: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 1,132.03 ft (345.043 m) National Geodetic Vertical Datum of 1929 (levels by Michigan Department of Natural Resources). Prior to Nov. 4, 1942, nonrecording gage at same site and datum.

REMARKS.--Records good except those for the winter period and those for period of no gage-height record, Feb. 4 to Mar. 13, which are fair. Flow regulated by Bond Falls Reservoir 7.5 mi (12.1 km) upstream (station 04034000). Diversion to South Branch Ontonagon River 8.5 mi (13.7 km) above station by Bond Falls Canal (station 04033500). Several observations of water temperature were made during the year.

AVERAGE DISCHARGE.--36 years, 68.6 ft<sup>3</sup>/s (1.943 m<sup>3</sup>/s).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,750 ft<sup>3</sup>/s (49.6 m<sup>3</sup>/s) Nov. 7, 1951, gage height, 5.05 ft (1.539 m); minimum, 14 ft<sup>3</sup>/s (0.40 m<sup>3</sup>/s) sometime during period Jan. 23 to Feb. 13, 1947, gage height, 1.14 ft (0.347 m), from recorded range in stage, caused by ice jams upstream.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 170 ft<sup>3</sup>/s (4.81 m<sup>3</sup>/s) Aug. 23, gage height, 2.24 ft (0.683 m); minimum, 31 ft<sup>3</sup>/s (0.88 m<sup>3</sup>/s) Dec. 22, gage height, 1.48 ft (0.451 m), result of freezeup; minimum daily, 42 ft<sup>3</sup>/s (1.19 m<sup>3</sup>/s) Dec. 3, Jan. 8, 26, 27.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	48	48	46	46	44	45	51	50	71	58	54	57
2	46	47	44	45	44	45	51	50	70	58	69	57
3	46	46	42	45	45	45	51	49	68	58	59	57
4	45	46	43	44	45	45	52	48	66	57	56	57
5	45	46	46	44	45	45	54	48	64	55	55	54
6	45	46	44	44	45	45	56	48	62	55	54	45
7	45	54	44	45	45	46	58	47	61	61	53	45
8	57	51	46	42	45	46	60	47	62	62	53	45
9	59	50	46	43	45	48	62	48	62	59	53	45
10	54	49	45	44	45	48	66	48	61	57	53	46
11	67	49	45	44	45	48	69	48	60	56	53	48
12	76	48	45	45	45	48	69	50	60	55	53	47
13	63	48	46	45	45	48	69	50	60	55	53	47
14	55	48	46	45	45	48	69	52	60	56	53	52
15	51	48	46	46	45	48	66	55	60	55	59	47
16	49	50	46	45	45	48	64	55	60	54	63	46
17	48	48	47	44	45	48	64	55	58	55	57	45
18	50	48	49	44	45	48	65	54	60	70	60	45
19	48	46	48	44	45	48	65	53	60	59	59	45
20	48	48	48	44	45	48	65	52	60	59	56	45
21	46	47	49	44	45	48	64	50	60	57	55	45
22	46	46	48	44	45	48	62	49	59	61	55	44
23	46	46	45	44	45	48	60	47	58	62	125	44
24	46	44	46	44	45	48	60	46	58	56	79	44
25	46	44	46	44	45	48	58	46	58	68	64	44
26	46	44	46	42	45	48	57	46	58	69	60	45
27	46	44	46	42	45	49	56	47	58	60	71	47
28	46	46	46	43	45	50	54	54	58	57	80	46
29	45	46	46	44	---	50	53	63	58	57	66	48
30	45	47	45	43	---	50	51	70	58	54	61	48
31	46	---	44	43	---	50	---	71	---	54	58	---
TOTAL	1549	1418	1419	1365	1258	1475	1801	1596	1828	1809	1899	1430
MEAN	50.0	47.3	45.8	44.0	44.9	47.6	60.0	51.5	60.9	58.4	61.3	47.7
MAX	76	54	49	46	45	50	69	71	71	70	125	57
MIN	45	44	42	42	44	45	51	46	58	54	53	44

CAL YR 1977 TOTAL 18704 MEAN 51.2 MAX 120 MIN 42  
WTR YR 1978 TOTAL 18847 MEAN 51.6 MAX 125 MIN 42

## STREAMS TRIBUTARY TO LAKE SUPERIOR

04035000 EAST BRANCH ONTONAGON RIVER NEAR MASS, MI

LOCATION.--Lat 46°41'24", long 89°04'24", in SW¼ NW¼ sec.33, T.50 N., R.38 W., Ontonagon County, Hydrologic Unit 04020102, on right bank 700 ft (213 m) downstream from abandoned highway bridge, 1,000 ft (305 m) downstream from Adventure Creek, 5.0 mi (8.0 km) south of Mass, and 7.5 mi (12.1 km) upstream from mouth.

DRAINAGE AREA.--272 mi<sup>2</sup> (704 km<sup>2</sup>).

PERIOD OF RECORD.--July 1942 to current year.

REVISED RECORDS.--WSP 1911: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 873.55 ft (266.258 m) National Geodetic Vertical Datum of 1929 (levels by Michigan Department of Natural Resources). Prior to Oct. 1, 1949, nonrecording gage at site 700 ft (213 m) upstream at same datum.

REMARKS.--Records good except those for the winter period, which are fair. Several observations of water temperature were made during the year.

AVERAGE DISCHARGE.--36 years, 258 ft<sup>3</sup>/s (7.307 m<sup>3</sup>/s), 12.88 in/yr (327 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 4,590 ft<sup>3</sup>/s (130 m<sup>3</sup>/s) July 1, 1953, gage height, 10.57 ft (3.222 m); maximum gage height, 10.65 ft (3.246 m) Apr. 24, 1960; minimum discharge, 60 ft<sup>3</sup>/s (1.70 m<sup>3</sup>/s) Aug. 25, 1948, gage height, 3.55 ft (1.082 m), site then in use; minimum gage height, 3.28 ft (1.000 m) Sept. 13, 1976.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 1,750 ft<sup>3</sup>/s (49.6 m<sup>3</sup>/s) Aug. 24, gage height, 7.36 ft (2.243 m), only peak above base of 1,400 ft<sup>3</sup>/s (40 m<sup>3</sup>/s); minimum, 97 ft<sup>3</sup>/s (2.75 m<sup>3</sup>/s) Aug. 15, gage height, 3.38 ft (1.030 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	244	141	175	160	130	130	573	291	575	113	126	218
2	198	141	175	160	130	130	522	255	458	115	174	178
3	172	137	170	160	130	130	406	237	337	115	329	159
4	154	134	160	155	130	130	400	218	254	112	237	147
5	149	131	155	155	130	130	558	201	225	110	177	139
6	143	129	150	150	130	130	758	188	196	109	140	134
7	139	213	150	150	130	130	910	176	187	121	124	129
8	280	366	150	145	130	130	802	178	267	340	115	127
9	438	314	150	145	130	130	798	206	235	293	110	127
10	387	264	150	140	130	130	995	239	195	211	105	125
11	589	235	150	140	130	130	738	221	176	165	102	177
12	792	218	150	135	130	135	606	418	208	138	103	214
13	512	203	150	135	130	135	730	338	203	146	102	188
14	377	195	150	135	130	135	554	423	169	127	100	230
15	295	206	155	135	130	135	506	441	153	120	113	354
16	243	261	160	130	130	135	602	350	146	116	228	252
17	213	248	190	130	130	135	742	275	141	109	257	211
18	215	236	230	130	130	130	790	229	243	175	208	178
19	207	216	260	130	130	130	738	199	275	242	231	161
20	189	428	260	130	130	130	762	183	200	265	200	154
21	175	443	240	130	130	135	634	169	185	202	164	148
22	163	218	220	130	130	135	622	156	168	161	138	141
23	151	223	210	130	130	135	654	146	143	243	964	131
24	147	201	190	130	130	140	674	139	133	226	1290	125
25	146	134	185	130	130	140	658	135	133	179	644	120
26	145	130	180	130	130	145	574	144	135	211	460	118
27	144	150	175	130	130	150	518	172	131	212	432	124
28	148	160	175	130	130	170	473	673	123	218	697	132
29	143	170	170	130	---	200	420	803	116	175	536	137
30	139	175	165	130	---	240	350	956	114	154	369	166
31	138	---	165	130	---	350	---	775	---	137	275	---
TOTAL	7575	6420	5515	4280	3640	4570	19067	9534	6224	5360	9250	4954
MEAN	244	214	178	138	130	147	636	308	207	173	298	165
MAX	792	443	260	160	130	350	995	956	575	340	1290	354
MIN	138	129	150	130	130	130	350	135	114	109	100	118
CFSM	.90	.79	.65	.51	.48	.54	2.34	1.13	.76	.64	1.10	.61
IN.	1.04	.88	.75	.59	.50	.63	2.61	1.30	.85	.73	1.27	.68
CAL YR 1977 TOTAL	81465			MEAN 223	MAX 1630	MIN 81	CFSM .82	IN 11.14				
WTR YR 1978 TOTAL	86389			MEAN 237	MAX 1290	MIN 100	CFSM .87	IN 11.81				

LOCATION.--Lat 46°41'57", long 89°09'36", in SE<sup>1</sup>/<sub>4</sub> sec.27, T.50 N., R.39 W., Ontonagon County, Hydrologic Unit 04020102, on left bank 10 ft (3 m) upstream from bridge on U.S. Highway 45, 700 ft (213 m) downstream from East Branch, and 2.8 mi (4.5 km) southeast of Rockland.

PERIOD OF RECORD.--July 1942 to current year.

GAGE.--Water-stage recorder. Datum of gage is 661.1 ft (201.50 m) National Geodetic Vertical of 1929. Prior to April 1, 1959, nonrecording gage at site 400 ft (122 m) upstream at same datum. April 1, 1959 to Oct. 21, 1968, nonrecording gage at present site and datum.

REMARKS.--Records good except those for the winter period, which are fair. Regulation by Bond Falls Reservoir 30.0 mi (48.3 km) above station (station 04034000). Diversion to South Branch Ontonagon River 31.0 mi (49.9 km) above station by Bond Falls Canal (station 04033500). Several observations of water temperature were made during the year.

AVERAGE DISCHARGE.--36 years, 525 ft<sup>3</sup>/s (14.87 m<sup>3</sup>/s).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 27,000 ft<sup>3</sup>/s (765 m<sup>3</sup>/s) Aug. 22, 1942, gage height, 21.2 ft (6.46 m), from flood-marks, from rating curve extended above 7,500 ft<sup>3</sup>/s (212 m<sup>3</sup>/s) on basis of slope-area measurement of peak flow; minimum observed, 142 ft<sup>3</sup>/s (4.02 m<sup>3</sup>/s) Dec. 3, 1963, discharge measurement; minimum daily, 145 ft<sup>3</sup>/s (4.11 m<sup>3</sup>/s) Dec. 3, 1963.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 6,410 ft<sup>3</sup>/s (182 m<sup>3</sup>/s) Aug. 23, gage height, 9.44 ft (2.877 m); minimum daily, 190 ft<sup>3</sup>/s (5.38 m<sup>3</sup>/s) Mar. 18-21; minimum gage height, 4.22 ft (1.286 m) Aug. 10.

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	510	262	285	280	195	200	1400	464	1160	228	233	440
2	383	262	280	275	195	200	1390	408	967	227	321	374
3	320	262	280	270	195	200	990	376	690	227	531	347
4	288	260	280	260	195	200	1050	383	516	224	394	329
5	277	255	280	255	195	200	1750	360	456	216	307	320
6	265	248	280	250	195	200	2430	337	404	215	256	296
7	251	455	280	245	195	200	2840	337	365	237	230	288
8	538	862	280	240	195	200	2310	341	613	538	218	280
9	1320	607	275	235	195	200	2330	386	526	536	198	272
10	873	483	275	230	195	200	3550	456	422	382	198	256
11	1480	436	275	225	195	200	2080	425	375	306	198	280
12	3060	418	280	220	195	200	1460	646	405	262	204	356
13	1430	404	285	215	195	200	1880	571	417	269	210	329
14	834	393	290	210	195	195	1290	847	350	249	204	390
15	598	434	300	210	195	195	1160	985	318	234	215	523
16	475	613	330	205	195	195	1480	723	304	224	461	420
17	415	562	400	205	195	195	1790	530	288	214	461	358
18	392	491	520	200	200	190	1870	430	383	365	376	324
19	391	437	650	200	200	190	1600	392	478	417	480	310
20	366	933	660	200	200	190	1640	352	367	485	365	303
21	337	1200	550	195	200	190	1270	335	337	359	296	280
22	315	517	460	195	200	195	1190	282	319	290	256	272
23	290	431	420	195	200	200	1230	279	281	419	3460	264
24	282	422	390	195	200	205	1240	258	259	405	2960	248
25	278	389	370	195	195	220	1190	249	255	367	1160	240
26	276	350	350	195	200	245	1010	252	255	416	800	234
27	270	330	330	195	200	270	895	309	255	367	730	240
28	270	315	320	195	200	313	787	1290	245	353	1760	248
29	270	300	310	195	---	368	689	1930	240	309	1130	263
30	264	290	300	195	---	427	562	2760	235	276	680	296
31	262	---	290	195	---	630	---	1900	---	251	530	---
TOTAL	17580	13621	10875	6775	5510	7213	46353	19593	12485	9867	19822	9380
MEAN	567	454	351	219	197	233	1545	632	416	318	639	313
MAX	3060	1200	660	280	200	630	3550	2760	1160	538	3460	523
MIN	251	248	275	195	195	190	562	249	235	214	198	234
CAL YR 1977	TOTAL	174156	MEAN 477	MAX 4480	MIN 175							
WTR YR 1978	TOTAL	179074	MEAN 491	MAX 3550	MIN 190							

## STREAMS TRIBUTARY TO LAKE SUPERIOR

04036000 WEST BRANCH ONTONAGON RIVER NEAR BERGLAND, MI

LOCATION.--Lat 46°35'15", long 89°32'30", in SW¼ NE¼ sec.3, T.48 N., R.42 W., Ontonagon County, Hydrologic Unit 04020102, on right bank 0.4 mi (0.6 km) downstream from dam at outlet of Gogebic Lake and 1.5 mi (2.4 km) east of Bergland.

DRAINAGE AREA.--162 mi<sup>2</sup> (420 km<sup>2</sup>).

PERIOD OF RECORD.--July 1942 to current year.

REVISED RECORDS.--WSP 1911: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 1,290.81 ft (393.439 m) National Geodetic Vertical Datum of 1929. Prior to Nov. 5, 1942, nonrecording gage 0.4 mi (0.6 km) upstream at different datum.

REMARKS.--Records good except those below 25 ft<sup>3</sup>/s (0.71 m<sup>3</sup>/s), which are poor. Flow regulated by Gogebic Lake, usable capacity, 35,200 acre-ft (43.4 hm<sup>3</sup>). Several observations of water temperature were made during the year.

AVERAGE DISCHARGE.--36 years, 175 ft<sup>3</sup>/s (4.956 m<sup>3</sup>/s), 14.67 in/yr (373 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,400 ft<sup>3</sup>/s (39.6 m<sup>3</sup>/s) Apr. 26, 1960, gage height, 5.98 ft (1.823 m); minimum daily, 0.70 ft<sup>3</sup>/s (0.020 m<sup>3</sup>/s) Sept. 26 to Oct. 19, 1963.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 996 ft<sup>3</sup>/s (28.2 m<sup>3</sup>/s) June 1, gage height, 5.09 ft (1.551 m); minimum daily, 6.8 ft<sup>3</sup>/s (0.193 m<sup>3</sup>/s) May 21-25.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	192	273	208	318	279	150	103	221	979	109	89	113
2	191	260	269	308	271	148	97	44	954	106	52	141
3	194	250	266	299	261	145	105	36	919	103	53	124
4	233	232	255	284	255	143	114	21	878	101	52	128
5	296	232	248	270	251	139	117	12	846	110	51	180
6	337	210	222	278	247	136	128	11	764	105	46	150
7	451	210	229	286	241	134	148	10	589	100	21	115
8	445	210	250	275	235	131	162	10	464	111	10	115
9	451	172	248	269	231	130	182	11	401	112	10	115
10	461	90	244	281	226	126	219	11	414	101	9.5	110
11	515	77	232	278	220	125	247	10	354	100	9.2	40
12	683	87	221	264	214	122	266	8.0	143	102	9.2	11
13	798	95	189	253	182	121	292	7.4	97	92	9.2	11
14	785	88	142	243	204	122	307	7.4	175	90	9.2	163
15	759	90	117	234	201	120	317	7.4	208	31	9.2	241
16	750	113	146	225	195	120	332	7.4	203	10	9.8	213
17	735	96	165	221	192	119	353	7.4	194	10	9.5	206
18	575	94	171	228	187	116	377	7.4	188	27	9.5	193
19	451	53	96	218	183	116	407	7.4	186	11	9.5	195
20	451	30	16	154	180	112	432	7.4	212	11	9.5	178
21	336	29	57	199	176	113	450	6.8	239	12	9.2	171
22	237	24	125	192	176	111	461	6.8	140	12	9.2	169
23	232	101	138	184	173	109	470	6.8	136	30	237	170
24	230	210	158	176	165	108	480	6.8	128	66	336	138
25	232	241	180	165	164	104	491	6.8	122	71	118	92
26	225	347	178	163	160	103	499	7.4	121	69	38	43
27	210	376	276	167	156	102	505	8.0	117	64	24	28
28	249	322	366	161	153	102	503	21	112	29	25	30
29	304	260	378	155	---	99	489	559	114	11	26	31
30	300	207	328	231	---	100	482	959	109	11	24	30
31	291	---	302	289	---	98	---	970	---	116	24	---
TOTAL	12599	5079	6420	7268	5778	3724	9535	3022.6	10506	2033	1357.7	3644
MEAN	406	169	207	234	206	120	318	97.5	350	65.6	43.8	121
MAX	798	376	378	318	279	150	505	970	979	116	336	241
MIN	191	24	16	154	153	98	97	6.8	97	10	9.2	11

CAL YR 1977 TOTAL 60647.8 MEAN 166 MAX 798 MIN 2.3 CFSM 1.02 IN 13.93  
WTR YR 1978 TOTAL 70966.3 MEAN 194 MAX 979 MIN 6.8 CFSM 1.20 IN 16.30



## 33

LOCATION.--Lat 46°15'12", long 89°27'05", in NE¼ sec.32, T.45 N., R.41 W., Gogebic County, Hydrologic Unit 04020102, on left bank 80 ft (24 m) downstream from Cisco Lake Dam, 2.5 mi (4.0 km) upstream from Langford Creek, 5.0 mi (8.0 km) upstream from U.S. Highway 2, and 13 mi (21 km) west of Watermeet.

PERIOD OF RECORD.--October 1944 to current year.

GAGE.--Water-stage recorder. Datum of gage is 1,672.69 ft (509.836 m) National Geodetic Vertical Datum of 1929. Prior to Oct. 1, 1968, nonrecording gage at same site and at datum 4.00 ft (1.219 m) higher.

**AVERAGE DISCHARGE.**--34 years, 46.8 ft<sup>3</sup>/s (1.325 m<sup>3</sup>/s), 12.54 in/yr (319 mm/yr).

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 213 ft<sup>3</sup>/s (6.03 m<sup>3</sup>/s) Aug. 23, gage height, 5.71 ft (1.740 m); minimum daily, 0.35 ft<sup>3</sup>/s (0.010 m<sup>3</sup>/s) May 12.

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	53	98	47	46	28	28	28	2.7	83	14	1.5	184
2	52	95	47	46	28	28	28	2.2	87	14	59	177
3	60	91	46	46	29	28	29	1.7	73	14	101	171
4	86	91	46	45	28	28	46	1.6	61	14	98	127
5	96	89	45	44	29	28	63	1.3	52	34	64	98
6	95	87	46	45	29	28	76	1.2	45	46	42	59
7	104	81	45	45	29	28	84	.92	45	45	42	28
8	109	76	45	45	29	28	83	.70	46	32	18	28
9	111	78	46	45	28	28	86	.85	45	14	2.1	29
10	127	73	46	45	28	27	88	.55	47	14	2.1	27
11	151	57	46	45	28	27	88	.42	46	14	1.3	28
12	158	49	46	44	28	27	89	.35	45	14	1.0	28
13	158	50	45	44	28	27	88	.79	45	13	.85	30
14	153	40	44	44	28	28	87	3.6	46	13	.85	31
15	147	33	44	43	28	28	86	4.0	45	5.7	40	30
16	145	32	44	34	28	28	86	4.0	44	1.2	116	30
17	141	32	35	28	28	28	86	4.0	45	1.1	144	30
18	138	31	29	27	28	28	86	3.8	46	51	143	31
19	136	32	29	28	28	28	86	3.3	47	101	142	31
20	134	37	31	28	28	28	87	2.7	46	115	140	29
21	128	33	41	28	28	28	83	2.1	44	63	93	29
22	127	33	49	28	28	28	59	1.3	27	26	62	29
23	125	42	49	28	28	28	64	1.3	15	28	152	29
24	120	50	49	28	27	27	78	1.0	15	29	211	27
25	116	50	49	28	28	27	73	1.0	15	78	209	28
26	113	49	48	28	28	26	57	1.0	15	118	205	28
27	108	47	48	29	28	26	53	1.3	14	64	207	27
28	107	47	48	29	28	26	58	2.0	14	28	206	27
29	104	47	47	29	---	26	26	2.9	14	12	201	28
30	103	47	46	28	---	26	3.3	15	14	3.0	196	27
31	102	---	46	28	---	27	---	52	---	2.0	189	---
TOTAL	3607	1697	1372	1128	788	851	2034.3	121.58	1226	1021.0	3089.70	1505
MEAN	116	56.6	44.3	36.4	28.1	27.5	67.8	3.92	40.9	32.9	99.7	50.2
MAX	158	98	49	46	29	28	89	52	87	118	211	184
MIN	52	31	29	27	27	26	3.3	.35	14	1.1	.85	2

CAL YR 1977	TOTAL	15120.36	MEAN	41.4	MAX	203	MIN	.09
WTR YR 1978	TOTAL	18440.58	MEAN	50.5	MAX	211	MIN	.35

## STREAMS TRIBUTARY TO LAKE SUPERIOR

04040000 ONTONAGON RIVER NEAR ROCKLAND, MI  
(National stream-quality accounting network station)

LOCATION.--Lat 46°43'15", long 89°12'25", in NE¼ sec.20, T.50 N., R.39 W., Ontonagon County, Hydrologic Unit 04020102, on left bank 50 ft (15 m) downstream from bridge on Victoria Road, 1.8 mi (2.9 km) southwest of Rockland, and 2.4 mi (3.9 km) downstream from confluence of Middle and West Branches.

DRAINAGE AREA.--1,340 mi<sup>2</sup> (3,470 km<sup>2</sup>).

## WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--June 1942 to current year.

REVISED RECORDS.--WSP 1387: 1943, 1946-47. WSP 1911: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 638.72 ft (194.682 m) National Geodetic Vertical Datum of 1929. Prior to Nov. 23, 1943, nonrecording gage and Nov. 23, 1943 to Oct. 17, 1967, water-stage recorder at site 50 ft (15 m) upstream at same datum.

REMARKS.--Water-discharge records fair. Plugged or partially plugged intakes Oct. 1 to Aug. 15; no gage-height record Aug. 16 to Sept. 30. Daily discharge determined from combined records of daily discharge at 04035500 Middle Branch Ontonagon River near Rockland and records of daily discharge at powerplant on West Branch Ontonagon River. Powerplant records computed on the basis of load-discharge rating of hydro electric units and rating for gate openings during periods of spill. Ratings developed by U.S. Geological Survey. Considerable regulation by powerplant on West Branch 5 mi (8 km) above station; Bond Falls Reservoir 25 mi (40 km) above station (station 04034000); Gogebic and Cisco Lakes, combined usable capacity, 50,800 acre-ft (62.6 km<sup>3</sup>), in headwaters.

AVERAGE DISCHARGE.--36 years, 1,403 ft<sup>3</sup>/s (39.73 m<sup>3</sup>/s), 14.22 in/yr (361 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 42,000 ft<sup>3</sup>/s (1,190 m<sup>3</sup>/s) Aug. 22, 1942, gage height, 28.6 ft (8.73 m) from flood-mark, from rating curve extended above 14,000 ft<sup>3</sup>/s (396 m<sup>3</sup>/s) on basis of slope-area measurement of peak flow; minimum daily, 192 ft<sup>3</sup>/s (5.44 m<sup>3</sup>/s) July 28, 29, 1963.

EXTREMES FOR CURRENT YEAR.--Maximum daily discharge, 7,800 ft<sup>3</sup>/s (221 m<sup>3</sup>/s) Apr. 10, no peak recorded above base of 9,000 ft<sup>3</sup>/s (255 m<sup>3</sup>/s); minimum daily, 420 ft<sup>3</sup>/s (11.89 m<sup>3</sup>/s) Aug. 13.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2600	1150	1210	1100	840	800	2100	1600	4500	640	700	1300
2	2600	1160	981	1050	860	800	2100	1300	3000	700	840	1100
3	2500	1160	1180	1000	880	800	2000	1150	3100	660	1150	900
4	1800	1150	998	950	880	800	2400	1000	3200	520	1000	900
5	1180	1140	889	1000	880	800	3500	750	2000	640	1050	800
6	1160	1060	1010	1050	870	800	5000	700	1400	670	800	900
7	1120	1270	1040	1050	860	800	6000	700	1400	670	640	950
8	1290	1650	1070	1100	860	780	5200	800	1450	1000	660	800
9	2510	1530	1110	1000	860	770	6000	1150	1400	820	600	800
10	3500	1440	1220	920	860	750	7800	1000	1300	880	540	780
11	5000	1360	940	900	850	730	6500	750	1200	700	580	1000
12	6800	1320	980	900	840	700	5000	1000	1250	670	620	1100
13	5500	1310	1050	920	830	680	5200	1150	1100	680	420	1100
14	4800	1230	1100	940	820	660	4000	1500	750	710	580	1050
15	4300	1230	1100	940	800	640	3600	2000	850	580	620	1200
16	3500	1510	1050	920	800	630	4000	1600	820	500	750	1200
17	2500	1510	1100	880	790	610	5000	1300	780	540	1000	1050
18	2100	1500	1290	860	780	600	5400	1100	840	540	900	1100
19	1900	1400	1600	860	760	580	4500	800	1050	800	1050	1000
20	1800	1660	1550	860	760	570	4800	900	800	1100	950	900
21	1690	2670	1450	850	760	560	4200	800	1000	900	850	940
22	1410	1210	1300	850	760	570	4500	560	720	800	750	900
23	1180	1300	1200	850	760	580	3900	600	780	880	6800	800
24	1170	1290	1100	850	770	600	3200	550	780	920	6000	700
25	1190	1160	1000	840	800	620	3100	600	580	900	3500	900
26	1180	1070	1000	830	800	650	3000	580	660	920	2700	700
27	1170	1120	1000	830	800	680	2900	580	600	1200	1600	900
28	1170	1080	1000	830	800	720	2200	2000	740	1200	3200	800
29	1170	1220	1000	830	---	800	1900	7200	600	940	2900	700
30	1080	1150	1100	830	---	950	1800	6600	540	700	2000	560
31	1140	---	1150	830	---	1250	---	7200	---	540	1400	---
TOTAL	72010	40010	34768	28420	22930	22280	120800	49520	39190	23920	47150	28120
MEAN	2323	1334	1122	917	819	719	4027	1597	1306	772	1521	937
MAX	6800	2670	1600	1100	880	1250	7800	7200	4500	1200	6800	1300
MIN	1080	1060	889	830	760	560	1800	550	540	500	420	500
CAL YR 1977	TOTAL 474219	MEAN 1299	MAX 9170	MIN 218								
WTR YR 1978	TOTAL 529118	MEAN 1450	MAX 7800	MIN 420								

04040000 ONTONAGON RIVER NEAR ROCKLAND, MI--CONTINUED

## WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1967, 1972 to current year.

PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE: October 1974 to current year.

WATER TEMPERATURES: October 1974 to current year.

INSTRUMENTATION.--Water-quality monitor October 1975 to September 1977.

REMARKS.--The instrument was inoperative for the entire water due to extremely heavy sediment deposits on the sensor probes caused by bridge construction upstream. Once-daily record based on samples collected near monitor site by an observer, May 5 to Sept. 30, 1978. Monthly samples collected as a cross-section sample at cableway 200 ft (61 m) upstream from bridge on Victoria Road prior to June 1977 and subsequently, at upstream side of new bridge at same site. Complete ice cover during winter period.

EXTREMES FOR PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE: Maximum recorded, 192 micromhos Mar. 26, 1977, May 28, 1978; minimum (water years 1975-76), 45 micromhos Dec. 2, 1975.

WATER TEMPERATURES (water years 1975-77): Maximum, 28.0°C July 19, 1977; minimum, 0.0°C on many days during winter periods.

## WATER QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DATE	TIME	STREAM- FLOW, INSTAN- TANEOUS (CFS)	SPF- CIFIC CON- DUCT- ANCE (MICRO- MHOS)	PH (UNITS)	TEMPER- ATURE (DEG C)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED SATUR- ATION	COLI- FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML)	STREP- TOCOCCEI FECAL, KF AGAR (COLS. PER 100 ML)	HARD- NESS, NFSS (MG/L AS CACO3)	HARD- NESS, NONCAR- BONATE (MG/L CACO3)
OCT											
19...	1030	2110	91	7.1	7.0	11.6	99	K24	K34	43	7
NOV											
22...	1000	1140	100	7.0	.0	14.1	98	220	620	50	10
DEC											
20...	0930	4670	120	7.4	.5	13.8	95	101	1010	54	8
JAN											
24...	1230	867	126	7.1	.0	13.4	94	K14	K22	65	7
FEB											
22...	1130	606	150	7.6	.0	13.4	94	K9	K19	69	3
MAR											
28...	1215	707	170	7.5	.0	13.6	96	K13	--	78	5
APR											
25...	1530	3570	70	7.6	6.5	12.2	99	K4	K25	34	10
MAY											
23...	1200	848	104	7.8	17.0	9.0	95	K20	K4	50	4
JUN											
27...	1000	456	146	7.8	19.0	8.7	96	44	1500	71	26
AUG											
02...	1400	1120	138	7.7	21.0	8.8	100	48	190	58	4
30...	0945	1860	98	7.3	17.5	8.8	93	120	190	49	0
SEP											
19...	1430	1120	120	7.7	16.0	9.7	100	38	--	57	6

DATE	CALCIUM DIS- SOLVED (MG/L AS CA)	MAGNE- SIUM, DIS- SOLVED (MG/L AS MG)	SODIUM, DIS- SOLVED (MG/L AS NA)	SODIUM AD- SORP- TION RATIO	SODIUM PERCENT	POTAS- SIUM, DIS- SOLVED (MG/L AS K)	BICAR- BONATE (MG/L AS HCO3)	CAP- BONATE (MG/L AS CO3)	ALKA- LINITY (MG/L AS CACO3)	CARBON DIOXIDE DIS- SOLVED (MG/L AS CO2)	SULFATE DIS- SOLVED (MG/L AS SO4)
OCT											
19...	12	3.2	1.9	.1	9	1.0	44	0	36	5.6	6.9
NOV											
22...	14	3.6	2.4	.1	9	1.5	49	0	40	7.8	5.6
DEC											
20...	15	4.0	2.7	.2	10	1.3	56	0	46	3.6	5.9
JAN											
24...	18	4.8	2.4	.1	7	1.0	70	0	57	8.9	6.1
FEB											
22...	19	5.2	2.6	.1	7	1.0	80	0	66	3.2	6.1
MAR											
28...	22	5.5	4.4	.2	11	1.1	88	0	72	4.5	6.4
APR											
25...	10	2.3	1.5	.1	8	1.0	30	0	25	1.2	8.3
MAY											
23...	14	3.6	3.0	.2	11	1.1	56	0	51	1.4	4.9
JUN											
27...	20	5.2	2.6	.1	7	1.0	84	0	45	2.1	5.1
AUG											
02...	16	4.4	2.0	.1	7	1.0	66	0	54	2.1	4.5
30...	14	3.3	1.6	.1	7	1.2	68	0	56	5.5	6.8
SEP											
19...	16	4.1	2.2	.1	8	.9	62	0	51	2.0	5.0

K--Results based on colony count outside the acceptable range (non-ideal colony count)

STREAMS TRIBUTARY TO LAKE SUPERIOR  
04040000 ONTONAGON RIVER NEAR ROCKLAND, MI--CONTINUED

WATER-QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978--CONTINUED

DATE	CHLORIDE, DIS- SOLVED (MG/L AS CL)	FLUORIDE, DIS- SOLVED (MG/L AS F)	SILICA, DIS- SOLVED (MG/L AS SiO2)	SOLIDS, RESIDUE AT 180 DEG. C DIS- SOLVED (MG/L)	SOLIDS, SUM OF CONSTITUENTS, DIS- SOLVED (MG/L)	SOLIDS, DIS- SOLVED (TONS PER DAY)	NITRO- GEN, NO2+NO3 TOTAL (MG/L AS N)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N)	NITRO- GEN, ORGANIC TOTAL (MG/L AS N)	NITRO- GEN, AM- MONIA + ORGANIC TOTAL (MG/L AS N)
OCT 19...	2.1	.0	7.9	78	57	444	.06	.01	--	--
NOV 22...	2.0	.0	8.8	89	62	274	.11	.01	--	--
DEC 20...	2.5	.0	9.7	94	69	1190	.20	.04	--	--
JAN 24...	2.3	.1	11	103	81	241	.17	.01	.44	.45
FEB 22...	1.8	.0	11	111	86	182	.17	.02	.49	.51
MAR 28...	5.1	.1	11	88	99	168	.16	.01	.59	.60
APR 25...	1.4	.0	6.2	70	46	675	.13	.02	.66	.68
MAY 23...	.5	.0	6.0	100	112	229	.01	.03	--	--
JUN 27...	2.7	.0	8.2	108	113	133	.00	.02	.35	.37
AUG 02...	1.8	.1	7.8	110	70	333	.04	.01	.77	.78
SEP 30...	2.2	.0	8.6	113	71	567	.09	.02	.83	.85
SEP 19...	2.1	.0	.8	96	62	290	.02	.01	.58	.59

DATE	NITRO- GEN, NH4 + ORG. SUSP. TOTAL (MG/L AS N)	NITRO- GEN, AM- MONIA + ORGANIC DIS. (MG/L AS N)	NITRO- GEN, TOTAL (MG/L AS N)	NITRO- GEN, TOTAL (MG/L AS NO3)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, DIS- SOLVED (MG/L AS P)	CARBON, ORGANIC TOTAL (MG/L AS C)	SEDI- MENT, SUS- PENDED (MG/L)	SEDI- MENT DIS- CHARGE, SUS- PENDED (T/DAY)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM
OCT 19...	--	.52	--	--	.03	.01	--	31	177	100
NOV 22...	--	1.0	--	--	.09	.02	23	57	175	100
DEC 20...	--	.65	--	--	.07	.02	11	--	--	--
JAN 24...	.13	.32	.62	2.7	.11	.00	--	--	--	--
FEB 22...	.03	.48	.68	3.0	.21	.01	9.7	--	--	--
MAR 28...	.36	.24	.76	3.4	.10	.01	7.0	--	--	--
APR 25...	.11	.57	.81	3.6	.10	.01	--	78	752	100
MAY 23...	--	.40	--	--	.05	.01	7.0	21	48	100
JUN 27...	.12	.25	.37	1.6	.05	.00	8.6	29	36	100
AUG 02...	.77	.01	.82	3.6	.04	.01	--	19	57	100
SEP 30...	.10	.75	.94	4.2	.12	.04	15	74	372	100
SEP 19...	.00	--	.61	2.7	.04	.01	11	25	76	100



## STREAMS TRIBUTARY TO LAKE SUPERIOR

37

04040000 ONTONAGON RIVER NEAR ROCKLAND, MI--CONTINUED

## WATER-QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978--CONTINUED

DATE	TIME	ARSENIC TOTAL (UG/L AS AS)	ARSENIC DIS- SOLVED (UG/L AS AS)	BARIUM, TOTAL RECOV- ERABLE (UG/L AS BA)	BARIUM, DIS- SOLVED (UG/L AS BA)	CADMIUM TOTAL RECOV- ERABLE (UG/L AS CD)	CADMIUM DIS- SOLVED (UG/L AS CD)	CHRO- MIUM, TOTAL RECOV- ERABLE (UG/L AS CR)	CHRO- MIUM, DIS- SOLVED (UG/L AS CR)	COBALT, TOTAL RECOV- ERABLE (UG/L AS CO)
OCT 19...	1030	2	2	0	0	1	0	20	0	3
JAN 24...	1230	0	0	200	200	1	1	<10	0	12
APR 25...	1530	2	1	0	0	1	1	100	1	4
AUG 02...	1400	1	1	0	0	2	1	<10	4	0

DATE	CORALT, DIS- SOLVED (UG/L AS CO)	COPPER, TOTAL RECOV- ERABLE (UG/L AS CU)	COPPER, DIS- SOLVED (UG/L AS CU)	IRON, TOTAL RECOV- ERABLE (UG/L AS FE)	IRON, DIS- SOLVED (UG/L AS FE)	LEAD, TOTAL RECOV- ERABLE (UG/L AS PR)	LEAD, DIS- SOLVED (UG/L AS PB)	MANGA- NESE, TOTAL RECOV- ERABLE (UG/L AS MN)	MANGA- NESE, DIS- SOLVED (UG/L AS MN)	MERCURY TOTAL RECOV- ERABLE (UG/L AS HG)
OCT 19...	3	7	7	1000	220	8	5	30	10	<.5
JAN 24...	6	11	3	3000	150	9	6	90	10	<.5
APR 25...	0	16	6	2900	240	7	5	70	10	<.5
AUG 02...	0	10	4	540	140	16	3	70	10	<.5

DATE	MERCURY DIS- SOLVED (UG/L AS HG)	SELE- NIUM, TOTAL (UG/L AS SE)	SELE- NIUM, DIS- SOLVED (UG/L AS SE)	SILVER, TOTAL RECOV- ERABLE (UG/L AS AG)	SILVER, DIS- SOLVED (UG/L AS AG)	ZINC, TOTAL RECOV- ERABLE (UG/L AS ZN)	ZINC, DIS- SOLVED (UG/L AS ZN)	CARBON, ORGANIC DIS- SOLVED (MG/L AS C)	CARBON, ORGANIC SUS- PENDE TOTAL (MG/L AS C)
OCT 19...	<.5	0	0	0	0	20	20	7.2	--
JAN 24...	<.5	0	0	0	0	30	10	1.6	.2
APR 25...	<.5	0	0	0	0	40	0	1.3	1.1
AUG 02...	<.5	0	0	0	0	30	10	3.4	.5

QUALITATIVE AND ASSOCIATED QUANTITATIVE ANALYSES OF BIOLOGICAL DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
PERIPHYTON

DATE	TIME	LENGTH OF EXPO- SURE (DAYS)	PERI- PHYTON BIOMASS ASH WEIGHT G/SQ M	PERI- PHYTON BIOMASS TOTAL WEIGHT G/SQ M	CHLOR-A PERI- PHYTON CHROMO- GRAPHIC FLUOROM (MG/M2)	CHLOR-R PERI- PHYTON CHROMO- GRAPHIC FLUOROM (MG/M2)
NOV 22...	1000	33	1.42	1.50	1.00	.000
FEB 22...	1130	29	.079	.236	.070	.000
SEP 19...	1430	21	35.4	37.2	20.3	1.65

STREAMS TRIBUTARY TO LAKE SUPERIOR  
04040000 ONTONAGON RIVER NEAR ROCKLAND, MI--CONTINUED

SPECIFIC CONDUCTANCE (MICROMHOS/CM AT 25 DEG. C), WATER, YEAR OCTOBER 1977 TO SEPTEMBER 1978  
ONCE-DAILY

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1								---	83	124	121	106
2								---	79	151	127	120
3								---	80	150	129	110
4								---	80	134	124	114
5								112	82	134	138	124
6								144	98	134	140	116
7								130	90	140	125	120
8								130	110	136	138	120
9								124	104	150	116	162
10								123	104	129	129	135
11								133	102	151	138	131
12								114	104	136	126	132
13								116	104	131	---	126
14								144	115	130	188	135
15								117	106	145	134	137
16								108	109	165	146	126
17								108	118	139	130	130
18								106	118	178	149	121
19								107	117	141	148	120
20								114	120	141	126	126
21								119	114	136	125	120
22								118	120	158	124	130
23								124	114	168	148	131
24								130	120	140	122	131
25								115	120	132	112	134
26								138	128	134	80	133
27								190	128	134	102	145
28								192	120	130	144	146
29								144	130	130	106	132
30								103	134	120	105	156
31								81	---	120	104	---

TEMPERATURE (DEG. C) OF WATER, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
ONCE-DAILY

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1								---	16.5	22.0	21.0	20.5
2								---	17.0	21.0	21.0	21.5
3								---	18.0	24.0	19.5	19.0
4								---	17.0	22.0	22.0	21.0
5								12.0	---	23.0	22.0	21.5
6								11.5	20.0	23.0	22.5	23.0
7								11.5	17.0	22.5	23.5	21.5
8								11.0	17.5	22.0	23.5	21.0
9								9.5	17.0	19.5	23.0	22.0
10								14.0	19.0	22.0	23.0	22.0
11								16.0	18.0	21.0	21.5	21.0
12								14.0	16.5	21.0	23.5	18.5
13								9.0	18.0	20.5	---	17.5
14								8.0	17.0	22.0	27.0	17.0
15								11.0	18.5	19.5	24.0	17.0
16								12.0	20.0	---	21.5	16.0
17								14.0	18.0	23.0	24.0	16.5
18								15.5	19.5	24.0	22.5	15.5
19								15.5	21.0	---	21.5	17.0
20								13.0	18.5	23.5	22.5	16.0
21								15.0	20.0	22.5	21.5	16.0
22								16.0	20.5	18.5	21.0	14.0
23								17.5	20.0	17.0	18.5	15.0
24								19.0	19.0	23.0	17.5	15.5
25								18.0	19.0	23.5	18.5	14.0
26								22.0	20.0	23.5	18.5	16.5
27								22.0	21.5	22.5	19.0	16.0
28								21.0	22.5	21.5	19.0	15.5
29								20.0	24.0	20.5	20.0	14.0
30								18.5	22.5	21.5	20.0	13.5
31								18.0	---	20.0	20.0	---

## STREAMS TRIBUTARY TO LAKE SUPERIOR

39

04040500 STURGEON RIVER NEAR SIDNAW, MI

LOCATION.--Lat 46°35'03", long 88°34'33", in NE¼ Sec. 5, T.48 N., R.34 W., Baraga County, Hydrologic Unit 04020104, on right bank 30 ft (9 m) downstream from highway bridge, 3.0 mi (4.8 km) downstream from Rock River, 3.5 mi (5.6 km) northwest of Covington, 6.5 mi (10.5 km) upstream from Perch River, 8.5 mi (13.7 km) northeast of Sidnaw, and at mile 71 (114 km).

DRAINAGE AREA.--171 mi<sup>2</sup> (443 km<sup>2</sup>).

PERIOD OF RECORD.--October 1912 to September 1915, April 1943 to current year. Monthly discharge only for some periods, published in WSP 1307.

REVISED RECORDS.--WSP 1507: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 1,214.40 ft (370.149 m) National Geodetic Vertical Datum of 1929. October 1912 to September 1915, nonrecording gage at site 200 ft (61 m) upstream at different datum. April 2, 1943 to Oct. 1, 1946, nonrecording gage at present site and datum.

REMARKS.--Records good except those for the winter period, which are fair. Several observations of water temperature were made during the year.

AVERAGE DISCHARGE.--38 years, 211 ft<sup>3</sup>/s (5.976 m<sup>3</sup>/s), 16.76 in/yr (426 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 4,630 ft<sup>3</sup>/s (131 m<sup>3</sup>/s) Apr. 24, 1960, gage height, 11.63 ft (3.545 m); minimum, 2.7 ft<sup>3</sup>/s (0.076 m<sup>3</sup>/s) Sept. 13, 1976, gage height, 3.17 ft (0.966 m).

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 1,470 ft<sup>3</sup>/s (41.6 m<sup>3</sup>/s) Apr. 29, gage height, 7.56 ft (2.304 m); minimum, 46 ft<sup>3</sup>/s (1.30 m<sup>3</sup>/s) July 6, gage height, 3.98 ft (1.213 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	336	122	141	120	55	62	100	1130	424	75	126	400
2	288	122	135	120	55	61	145	878	329	68	202	370
3	246	126	131	120	55	61	140	740	285	62	264	330
4	212	122	126	115	55	61	140	650	249	56	234	300
5	195	114	122	115	55	60	175	610	234	52	182	255
6	175	110	121	110	55	58	249	560	205	49	149	225
7	161	261	117	105	55	56	300	500	178	60	126	200
8	252	382	117	105	56	55	330	452	210	155	110	180
9	406	329	117	100	57	54	354	460	202	175	94	170
10	406	294	117	96	58	54	385	555	190	159	82	160
11	452	273	119	94	59	54	374	585	198	133	73	250
12	505	249	119	90	59	54	354	770	231	110	67	436
13	510	215	120	86	60	54	388	750	218	94	59	580
14	456	200	120	84	60	54	354	710	180	89	54	680
15	402	192	120	80	60	54	332	620	155	145	72	620
16	357	200	125	78	61	54	346	515	139	165	312	515
17	318	205	135	74	61	54	432	436	141	137	228	413
18	300	208	140	70	61	54	555	374	270	185	208	343
19	288	195	145	68	61	54	580	318	315	288	322	294
20	261	210	150	66	61	54	550	291	258	357	300	264
21	240	270	159	64	61	53	505	252	222	340	234	249
22	212	252	155	62	61	52	585	222	200	322	171	218
23	192	240	150	62	62	51	755	195	169	357	812	195
24	175	220	145	58	62	50	884	175	145	326	1000	167
25	167	208	140	57	62	50	1140	159	135	315	850	151
26	157	190	135	56	62	51	1300	153	133	294	750	151
27	149	170	130	55	63	52	1370	175	133	252	700	165
28	149	155	130	55	63	53	1400	402	119	205	600	175
29	141	149	130	55	---	55	1440	326	100	188	550	192
30	135	141	125	55	---	56	1400	488	89	165	500	220
31	130	---	125	55	---	58	---	444	---	145	450	---
TOTAL	8373	6124	4061	2530	1655	1703	17362	14895	6056	5523	9881	8868
MEAN	270	204	131	81.6	52.1	54.9	579	480	202	178	319	296
MAX	510	382	159	120	63	62	1440	1130	424	357	1000	680
MIN	130	110	117	55	55	50	100	153	89	49	54	151
CFSM	1.58	1.19	.77	.44	.35	.32	3.39	2.81	1.18	1.04	1.87	1.73
IN.	1.82	1.33	.44	.55	.36	.37	3.78	3.24	1.32	1.20	2.15	1.93

CAL YR 1977 TOTAL 72436 MEAN 198 MAX 2100 MIN 15 CFSM 1.16 IN 15.76  
WTR YR 1978 TOTAL 87031 MEAN 238 MAX 1440 MIN 49 CFSM 1.39 IN 18.93

## STREAMS TRIBUTARY TO LAKE SUPERIOR

04041500 STURGEON RIVER NEAR ALSTON, MI

LOCATION.--Lat 46°43'35", long 88°39'43", in SE¼ sec.15, T.50 N., R.35 W., Baraga County, Hydrologic Unit 04020104, on right bank in powerhouse of Upper Peninsula Power Co. at Prickett Dam, 4.0 mi (6.4 km) upstream from Clear Creek, 5.0 mi (8.0 km) southeast of Alston, and at mile 45 (72 km).

DRAINAGE AREA.--346 mi<sup>2</sup> (896 km<sup>2</sup>).

PERIOD OF RECORD.--February 1932 to June 1941, October 1942 to current year. Monthly discharge only for some periods, published in WSP 1507.

GAGE.--Water-stage recorder. Datum of gage is 710.3 ft (216.50 m) mean tide at New York City datum (levels by Corps of Engineers). Prior to Oct. 1, 1963, at datum 40.00 ft (12.192 m) lower.

REMARKS.--Records good except those below 20 ft<sup>3</sup>/s (0.57 m<sup>3</sup>/s), which are poor. Flow regulated by powerplant at station. Several observations of water temperature were made during the year.

AVERAGE DISCHARGE.--44 years, (water years 1933-40, 1943-78), 417 ft<sup>3</sup>/s (11.81 m<sup>3</sup>/s), 16.37 in/yr (416 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 7,360 ft<sup>3</sup>/s (208 m<sup>3</sup>/s) Apr. 24, 1960, gage height, 13.09 ft (3.990 m) present datum; minimum daily, 1 ft<sup>3</sup>/s (0.03 m<sup>3</sup>/s) Aug. 14-19, 1960.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 3,950 ft<sup>3</sup>/s (112 m<sup>3</sup>/s) Aug. 23, gage height, 9.14 ft (2.786 m); minimum, 11 ft<sup>3</sup>/s (0.312 m<sup>3</sup>/s) Mar. 19, gage height, 2.60 ft (0.792 m); minimum daily, 13 ft<sup>3</sup>/s (0.368 m<sup>3</sup>/s) Jan. 22.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	625	290	283	241	190	312	356	1290	719	266	269	617
2	627	241	258	239	192	340	332	1090	614	16	269	746
3	602	237	257	239	192	374	367	868	616	268	270	553
4	342	239	258	240	193	321	560	741	617	17	320	653
5	319	239	258	215	173	288	467	616	607	242	320	553
6	251	236	260	214	168	286	367	616	413	217	321	651
7	316	309	282	214	169	163	554	619	338	218	336	353
8	316	373	235	215	168	114	567	725	401	318	268	337
9	532	436	236	215	170	295	736	619	407	319	269	339
10	621	616	236	215	178	342	1010	624	349	319	269	340
11	623	618	212	214	180	306	639	708	331	268	229	436
12	765	616	210	214	180	275	586	1090	333	267	229	448
13	678	615	210	214	180	303	669	1170	333	267	17	447
14	725	325	210	213	180	111	641	1030	328	268	291	553
15	655	312	217	213	179	400	590	726	334	270	211	432
16	621	313	219	213	180	367	589	640	339	16	318	748
17	621	313	218	216	304	360	591	777	289	265	412	666
18	619	315	219	216	376	211	843	642	290	342	424	557
19	619	315	227	215	339	198	1060	624	264	280	430	664
20	382	365	324	216	262	130	925	628	375	436	627	661
21	360	369	325	214	14	149	852	625	415	626	626	658
22	361	386	327	13	14	211	775	611	418	613	440	555
23	361	369	327	152	239	199	872	408	417	417	1150	342
24	292	356	327	191	345	294	1140	356	378	419	1980	240
25	296	357	327	195	339	165	1250	343	342	432	1280	241
26	238	335	326	201	240	166	1290	308	274	619	1270	278
27	319	332	234	218	237	166	1450	309	290	556	1070	261
28	290	284	218	213	14	210	1480	412	287	368	1380	279
29	289	282	217	88	---	213	1440	615	292	371	1180	279
30	292	283	248	213	---	217	1450	668	267	319	1120	279
31	289	---	240	185	---	307	---	940	---	320	927	---
TOTAL	14246	10676	7945	6274	5595	7793	24448	21438	11677	9939	10432	15166
MEAN	460	356	256	202	200	251	815	692	389	321	595	506
MAX	765	618	327	241	376	400	1480	1290	719	626	1980	832
MIN	238	236	210	13	14	111	332	308	264	16	17	278
CFSM	1.33	1.03	.74	.58	.58	.73	2.36	2.00	1.12	.93	1.72	1.46
IN.	1.53	1.15	.85	.67	.60	.84	2.63	2.30	1.26	1.07	1.98	1.83

CAL YR 1977 TOTAL 128052 MEAN 351 MAX 2450 MIN 12 CFSM 1.01 IN 13.77  
WTR YR 1978 TOTAL 153629 MEAN 421 MAX 1980 MIN 13 CFSM 1.22 IN 16.52



## STREAMS TRIBUTARY TO LAKE SUPERIOR

41

04043004 STURGEON RIVER NEAR CHASSELL, MI  
(National stream-quality accounting network station)

LOCATION.--Lat 46°58'28", long 88°31'21", in NE¼ SW¼ sec.20, T.53 N., R.33 W., Houghton County, Hydrologic Unit 04020104, 2.2 mi (3.5 km) upstream from bridge on county road, 3.5 mi (5.6 km) south of Chassell, 5.0 mi (8.0 km) downstream from Otter Lake, and at mile 5.2 (8.4 km).

DRAINAGE AREA.--723 mi<sup>2</sup> (1,873 km<sup>2</sup>).

PERIOD OF RECORD.--January to September 1978.

PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE: March to September 1978.

WATER TEMPERATURES: March to September 1978.

REMARKS.--Daily record is from once daily observer samples. In addition, monthly samples are collected as a cross-section sample at bridge 2.2 mi (3.5 km) downstream and in the winter, through the ice in the vicinity of the site. Complete ice cover during winter period.

EXTREMES FOR PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE: Maximum daily, 174 micromhos Mar. 29, 1978; minimum daily, 63 micromhos May 1, 1978.

WATER TEMPERATURES: Maximum daily, 26.0°C July 26, 1978; minimum daily, 1.0°C Mar. 29, Apr. 1, 1978.

EXTREMES OUTSIDE PERIOD OF RECORD.--A water temperature of 0°C was observed Jan. 25, Feb. 23, 1978.

## WATER QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DATE	TIME	STREAM- FLOW- INSTAN- TANEOUS (CFS)	SPE- CIFIC CON- DUCT- ANCE (MICRO- MHOS)	PH (UNITS)	TEMPER- ATURE (DEG C)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION)	COLI- FORM. FECAL, 0.7 UM-MF (COLS./ 100 ML)	STREP- TOCOCCI FECAL, KF AGAR NESS (COLS. PER 100 ML)	HARD- NESS (MG/L AS CAC03)	HARD- NESS, NONCAR- BONATE (MG/L CAC03)
JAN 25...	1630	390	150	6.8	.0	11.6	82	<1	19	74	7
FEB 23...	1100	212	166	7.1	.0	10.7	75	K1	37	78	0
MAR 29...	1600	552	174	7.6	1.0	13.7	95	--	--	85	3
APR 26...	1430	2980	65	7.2	6.0	11.2	91	K3	--	31	0
MAY 24...	1230	928	104	7.2	16.0	8.6	88	26	K576	50	5
JUN 28...	1100	717	132	7.2	21.0	7.8	88	81	74	56	2
AUG 03...	1430	742	158	7.6	20.5	8.2	91	110	160	68	3
31...	1100	1580	85	7.0	18.0	8.2	87	48	--	42	7
SEP 28...	1200	725	120	7.4	12.5	9.0	85	K6	21	70	12

DATE	CALCIUM DIS- SOLVED (MG/L AS CA)	MAGNE- SIUM, DIS- SOLVED (MG/L AS MG)	SODIUM, DIS- SOLVED (MG/L AS NA)	SODIUM AD- SORP- TION RATIO	SODIUM PERCENT	POTAS- SIUM, DIS- SOLVED (MG/L AS K)	BICAR- BONATE (MG/L AS HCO3)	CAR- BONATE (MG/L AS CO3)	ALKA- LINITY (MG/L AS CAC03)	CARBON DIOXIDE DIS- SOLVED (MG/L AS CO2)	SULFATE DIS- SOLVED (MG/L AS SO4)
JAN 25...	21	5.2	2.5	.1	7	1.0	82	0	67	21	7.3
FEB 23...	22	5.7	2.8	.1	7	1.1	95	0	78	12	5.6
MAR 29...	24	6.0	2.8	.1	7	1.1	100	0	82	4.0	6.6
APR 26...	8.5	2.4	1.6	.1	10	1.0	42	0	34	4.2	8.7
MAY 24...	14	3.6	1.8	.1	7	1.1	54	0	48	5.5	7.4
JUN 28...	16	4.0	2.0	.1	7	.9	64	0	54	6.5	4.6
AUG 03...	19	5.1	2.2	.1	6	1.2	80	0	66	3.2	3.8
31...	12	2.9	1.6	.1	7	1.0	42	0	34	6.7	6.5
SEP 28...	19	5.4	2.1	.1	6	1.0	70	0	57	4.5	5.5

K--RESULTS BASED ON COLONY COUNT OUTSIDE THE ACCEPTABLE  
RANGE (NON-IDEAL COLONY COUNT)

## STREAMS TRIBUTARY TO LAKE SUPERIOR

04043004 STURGEON RIVER NEAR CHASSELL, MI--CONTINUED

WATER-QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978--CONTINUED

DATE	CHLORIDE, DIS- SOLVED (MG/L AS CL)	FLUORIDE, DIS- SOLVED (MG/L AS F)	SILICA, DIS- SOLVED (MG/L AS SiO2)	SOLIDS, RESIDUE AT 180 DEG. C DIS- SOLVED (MG/L)	SOLIDS, SUM OF CONSTITUENTS, DIS- SOLVED (MG/L)	SOLIDS, DIS- SOLVED (TONS PER DAY)	NITRO- GEN, NO2+NO3 TOTAL (MG/L AS N)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N)	NITRO- GEN, ORGANIC TOTAL (MG/L AS N)	NITRO- GEN,AM- MONIA + ORGANIC TOTAL (MG/L AS N)
JAN 25...	2.9	.1	11	104	92	110	.15	.03	.16	.19
FEB 23...	1.4	.0	12	115	97	65.8	.15	.06	.36	.42
MAR 29...	1.7	.1	11	100	103	149	.14	.02	.35	.37
APR 26...	1.3	.0	7.3	68	52	547	.20	.01	.51	.52
MAY 24...	1.9	.0	6.6	245	111	614	.07	.05	--	--
JUN 28...	.7	.0	7.0	100	99	194	.06	.04	.44	.48
AUG 03...	1.8	.0	7.8	114	81	228	.07	.01	.54	.55
31...	2.8	.0	6.7	86	54	367	.07	.02	.72	.74
SEP 24...	2.2	.0	9.2	113	79	221	.08	.02	.25	.27
DATE	NITRO- GEN, NH4 + ORG. SUSP. TOTAL (MG/L AS N)	NITRO- GEN, AM- MONIA + ORGANIC DIS. (MG/L AS N)	NITRO- GEN, TOTAL (MG/L AS N)	NITRO- GEN, TOTAL (MG/L AS NO3)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, DIS- SOLVED (MG/L AS P)	CARBON, ORGANIC TOTAL (MG/L AS C)	SEDI- MENT, SUS- PENDED (MG/L)	SEDI- MENT DIS- CHARGE, SUS- PENDED (T/DAY)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM
JAN 25...	.00	--	.34	1.5	.06	.01	--	3	3.2	100
FEB 23...	.04	.38	.57	2.5	.02	.01	8.8	2	1.1	100
MAR 29...	.08	.29	.51	2.3	.02	.01	7.0	10	15	100
APR 26...	.00	--	.72	3.2	.05	.01	--	100	805	100
MAY 24...	--	.43	--	--	.03	.01	5.7	18	45	100
JUN 28...	.10	.38	.54	2.4	.02	.01	9.5	18	35	100
AUG 03...	.12	.43	.62	2.7	.04	.01	--	11	22	100
31...	.07	.67	.81	3.6	.06	.03	13	40	171	100
SEP 24...	.00	--	.35	1.6	.03	.01	11	14	27	100

## STREAMS TRIBUTARY TO LAKE SUPERIOR

43

04043004 STURGEON RIVER NEAR CHASSELL, MI--CONTINUED

WATER-QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978--CONTINUED

DATE	TIME	ARSENIC TOTAL (UG/L AS AS)	ARSENIC DIS- SOLVED (UG/L AS AS)	BARIUM, TOTAL RECOV- ERABLE (UG/L AS BA)	BARIUM, DIS- SOLVED (UG/L AS BA)	CADMIUM TOTAL RECOV- ERABLE (UG/L AS CD)	CADMIUM DIS- SOLVED (UG/L AS CD)	CHRO- MIUM, TOTAL RECOV- ERABLE (UG/L AS CR)	CHRO- MIUM, DIS- SOLVED (UG/L AS CR)	COBALT, TOTAL RECOV- ERABLE (UG/L AS CO)
JAN 25...	1630	0	0	0	0	1	1	<10	3	0
APR 26...	1430	2	1	0	0	0	0	20	1	0
AUG 03...	1430	1	1	0	0	3	2	10	10	0

DATE	TIME	COBALT, DIS- SOLVED (UG/L AS CO)	COPPER, TOTAL RECOV- ERABLE (UG/L AS CU)	COPPER, DIS- SOLVED (UG/L AS CU)	IRON, TOTAL RECOV- ERABLE (UG/L AS FE)	IRON, DIS- SOLVED (UG/L AS FE)	LEAD, TOTAL RECOV- ERABLE (UG/L AS PB)	LEAD, DIS- SOLVED (UG/L AS PB)	MANGA- NESE, TOTAL RECOV- ERABLE (UG/L AS MN)	MANGA- NESE, DIS- SOLVED (UG/L AS MN)	MERCURY TOTAL RECOV- ERABLE (UG/L AS HG)
JAN 25...	0	0	5	2	560	410	4	1	40	40	<.5
APR 26...	0	0	6	3	1100	240	5	4	40	20	<.5
AUG 03...	0	0	10	5	710	270	24	14	50	10	<.5

DATE	TIME	MERCURY DIS- SOLVED (UG/L AS HG)	SELE- NIUM, TOTAL (UG/L AS SE)	SELE- NIUM, DIS- SOLVED (UG/L AS SE)	SILVER, TOTAL RECOV- ERABLE (UG/L AS AG)	SILVER, DIS- SOLVED (UG/L AS AG)	ZINC, TOTAL RECOV- ERABLE (UG/L AS ZN)	ZINC, DIS- SOLVED (UG/L AS ZN)	CARBON, ORGANIC DIS- SOLVED (MG/L AS C)	CARBON, ORGANIC SUS- PENDED TOTAL (MG/L AS C)
JAN 25...		<.5	0	0	0	0	10	10	13	.4
APR 26...		<.5	0	0	0	0	10	10	1.5	.5
AUG 03...		<.5	0	0	0	0	30	10	12	.4

QUALITATIVE AND ASSOCIATED QUANTITATIVE ANALYSES OF BIOLOGICAL DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
PERIPHYTON

DATE	TIME	LENGTH OF EXPO- SURE (DAYS)	PERI- PHYTON BIOMASS ASH WEIGHT G/SQ M	PERI- PHYTON BIOMASS DRY WEIGHT G/SQ M	CHLOR-A PERI- PHYTON CHROMO- GRAPHIC FLUOROM (MG/M2)	CHLOR-B PERI- PHYTON CHROMO- GRAPHIC FLUOROM (MG/M2)
FEB 23...	1100	29	1.57	2.28	.180	.000
MAY 24...	1230	28	7.72	9.06	16.7	4.31

## STREAMS TRIBUTARY TO LAKE SUPERIOR

04043004 STURGEON RIVER NEAR CHASSELL, MI--CONTINUED

SPECIFIC CONDUCTANCE (MICROMHOS/CM AT 25 DEG. C) WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
ONCE-DAILY

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1						---	153	63	80	108	114	86
2						---	146	67	90	112	121	90
3						---	138	66	93	114	124	90
4						---	137	69	94	112	114	90
5						---	117	73	98	---	112	91
6						---	117	73	95	---	122	106
7						---	109	73	94	---	118	106
8						---	101	73	94	114	116	106
9						---	98	72	93	110	117	106
10						---	97	76	92	115	123	106
11						---	87	78	94	118	121	104
12						---	86	74	98	120	122	103
13						---	84	70	98	120	132	104
14						---	83	69	97	120	137	104
15						---	83	---	96	120	136	104
16						---	80	---	120	128	132	104
17						---	83	79	103	126	118	105
18						---	78	78	112	124	122	105
19						---	80	80	104	126	121	105
20						---	80	80	104	121	122	104
21						---	79	82	104	122	122	104
22						---	80	83	102	109	122	104
23						---	75	80	104	119	94	106
24						---	75	83	102	116	92	130
25						---	76	84	112	119	95	132
26						---	72	88	105	119	96	130
27						---	69	88	105	108	93	130
28						---	67	88	111	118	96	132
29						---	174	67	85	110	92	130
30						---	158	65	82	110	86	132
31						---	156	---	84	---	87	---
MAX							153		120		137	132
MIN							65		80		86	86

TEMPERATURE (DEG. C) OF WATER, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
ONCE-DAILY

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1						---	1.0	---	17.0	21.0	21.5	21.0
2						---	1.5	---	18.0	21.5	21.0	21.5
3						---	2.0	---	18.5	22.0	21.0	21.5
4						---	2.0	---	17.5	22.5	22.0	22.5
5						---	2.0	---	19.0	---	22.5	23.0
6						---	2.0	---	20.5	---	22.0	23.0
7						---	3.5	---	17.0	---	23.0	22.5
8						---	3.5	---	17.0	23.5	23.0	22.5
9						---	2.5	---	17.5	21.0	23.0	22.0
10						---	2.5	---	18.0	21.5	22.0	21.0
11						---	3.0	---	17.0	21.0	22.0	21.0
12						---	3.0	---	17.0	21.0	24.0	20.0
13						---	2.5	---	17.5	21.5	24.0	19.5
14						---	4.5	---	18.0	22.0	23.0	18.0
15						---	4.5	---	18.5	23.0	22.5	17.0
16						---	5.0	---	21.0	22.5	22.5	17.0
17						---	5.5	15.0	21.0	23.0	21.5	17.0
18						---	4.0	16.5	21.5	23.5	21.0	17.0
19						---	4.0	18.5	22.5	24.5	21.0	16.5
20						---	4.5	16.0	19.5	22.0	21.0	16.0
21						---	6.5	15.0	19.5	22.0	21.5	16.0
22						---	6.5	16.5	20.0	22.0	22.0	16.5
23						---	6.5	18.5	20.5	22.0	21.5	16.5
24						---	7.0	19.5	20.5	22.5	21.5	16.5
25						---	7.0	19.5	21.0	24.0	22.0	16.0
26						---	7.5	22.0	21.5	26.0	20.0	16.0
27						---	8.0	23.0	23.0	26.0	18.5	15.5
28						---	8.0	21.0	23.0	23.0	17.0	15.0
29						---	1.0	8.0	19.5	25.0	18.5	15.0
30						---	1.5	8.0	19.5	21.0	20.5	15.0
31						---	1.5	---	17.0	---	20.0	---
MEAN							4.5		19.5		21.5	18.5



## STREAMS TRIBUTARY TO LAKE SUPERIOR

45

04043050 TRAP ROCK RIVER NEAR LAKE LINDEN, MI

LOCATION.--Lat 47°13'43", long 88°23'07", in SE $\frac{1}{4}$  SE $\frac{1}{4}$  sec.20, T.56 N., R.32 W., Houghton County, Hydrologic Unit 04020103, on right bank 20 ft (6 m) upstream from bridge on county highway, 2.0 mi (3.2 km) northeast of Lake Linden, and 3.0 mi (4.8 km) upstream from mouth.

DRAINAGE AREA.--28.0 mi<sup>2</sup> (72.5 km<sup>2</sup>).

## WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--Occasional low-flow measurements, water years 1964 and 1966. October 1966 to current year.

GAGE.--Water-stage recorder. Datum of gage is 621.7 ft (189.49 m) National Geodetic Vertical Datum of 1929.

REMARKS.--Water-discharge records good except those for the winter period, which are fair. From April 1973 to December 1977, flow includes about 0.1 ft<sup>3</sup>/s (0.003 m<sup>3</sup>/s) mine pumpage. Small diversions for sprinkler irrigation.

AVERAGE DISCHARGE.--12 years, 42.9 ft<sup>3</sup>/s (1.215 m<sup>3</sup>/s), 20.81 in/yr (529 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,180 ft<sup>3</sup>/s (33.4 m<sup>3</sup>/s) May 2, 1972, gage height, 9.30 ft (2.835 m); minimum daily, 6.8 ft<sup>3</sup>/s (0.19 m<sup>3</sup>/s) Oct. 3, 1976; minimum gage height, 3.85 ft (1.173 m) June 23, 1977.

EXTREMES FOR CURRENT YEAR.--Peak discharges above base of 380 ft<sup>3</sup>/s (10.8 m<sup>3</sup>/s) and maximum (\*):

Date	Time	Discharge (ft <sup>3</sup> /s) (m <sup>3</sup> /s)	Gage height (ft) (m)	Date	Time	Discharge (ft <sup>3</sup> /s) (m <sup>3</sup> /s)	Gage height (ft) (m)
Apr. 29	0500	446 12.6	6.48 1.975	Sept. 11	1700	477 13.5	6.65 2.027
May 30	0800	*556 15.7	*7.10 2.164				

Minimum discharge, 8.8 ft<sup>3</sup>/s (0.25 m<sup>3</sup>/s) Mar. 17, gage height, 3.87 ft (1.180 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	65	35	29	28	19	17	35	118	99	19	15	18
2	50	33	35	27	19	17	32	98	85	18	17	16
3	40	28	83	27	19	17	32	95	60	17	15	15
4	35	25	29	26	19	17	38	100	47	16	15	14
5	35	23	27	25	20	18	55	92	41	16	14	14
6	35	21	28	24	20	18	65	80	34	15	14	14
7	31	27	28	25	20	17	63	69	34	18	13	13
8	91	46	28	21	19	17	63	82	53	40	13	13
9	120	40	25	23	19	17	62	118	38	32	13	13
10	79	34	25	24	19	17	65	107	35	30	13	14
11	88	33	25	23	19	16	67	71	35	22	13	300
12	98	29	25	23	19	16	77	58	28	19	12	173
13	77	27	25	22	19	16	76	49	25	29	12	67
14	59	26	24	22	19	17	65	69	22	24	12	112
15	48	27	24	22	20	17	77	73	21	20	12	91
16	42	34	29	22	19	16	110	56	22	18	15	51
17	38	39	51	22	19	17	148	45	22	17	15	36
18	35	50	90	22	19	17	167	39	21	24	14	30
19	32	43	78	22	19	17	156	34	20	25	14	26
20	30	61	68	22	20	17	150	48	18	29	14	23
21	28	113	82	22	20	17	145	45	18	22	13	21
22	26	62	65	22	21	17	172	35	20	21	12	19
23	24	48	57	22	21	17	225	30	21	21	46	18
24	24	42	49	21	20	17	286	27	19	19	60	16
25	23	40	42	20	19	17	334	25	18	18	35	16
26	24	38	39	18	18	18	338	26	30	17	24	15
27	23	32	36	19	17	18	341	25	72	16	21	15
28	25	30	34	19	17	22	351	108	48	15	37	15
29	23	28	32	19	---	25	335	81	30	16	30	17
30	22	28	30	19	---	26	179	415	21	16	25	19
31	23	---	29	19	---	30	---	188	---	15	20	---
TOTAL	1393	1142	1271	692	538	562	4309	2506	1057	644	598	1224
MEAN	44.9	38.1	41.0	22.3	19.2	18.1	144	80.8	35.2	20.8	19.3	40.8
MAX	120	113	90	28	21	30	351	415	99	40	60	300
MIN	22	21	24	18	17	16	32	25	18	15	12	13
CFSM	1.60	1.36	1.46	.80	.69	.65	5.14	2.89	1.26	.74	.69	1.46
IN.	1.85	1.52	1.69	.92	.71	.75	5.72	3.33	1.40	.86	.79	1.63

CAL YR 1977	TOTAL	16904.0	MEAN	46.3	MAX	560	MIN	8.5	CFSM	1.65	IN	22.46
WTR YR 1978	TOTAL	15936.0	MEAN	43.7	MAX	415	MIN	12	CFSM	1.56	IN	21.17

## STREAMS TRIBUTARY TO LAKE SUPERIOR

04043050 TRAP ROCK RIVER NEAR LAKE LINDEN, MI--CONTINUED

## WATER-QUALITY RECORDS

## PERIOD OF DAILY RECORD.--

WATER TEMPERATURES: October 1971 to current year.

## INSTRUMENTATION.--Temperature recorder since Oct. 1, 1971.

REMARKS.--Temperature recorder clock stopped Nov. 13 to Dec. 20 (range in temperature 0.0 to 4.5°C). Complete ice cover during winter period.

## EXTREMES FOR PERIOD OF DAILY RECORD.--

WATER TEMPERATURES: Maximum, 24.5°C July 30, 1975; minimum, 0.0°C on many days during winter periods.

## EXTREMES FOR CURRENT YEAR.--

WATER TEMPERATURES: Maximum, 21.5°C Aug. 14; minimum, 0.0°C on many days during winter period.

## TEMPERATURE (DEG. C) OF WATER, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DAY	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN
	OCTOBER		NOVEMBER		DECEMBER		JANUARY		FEBRUARY		MARCH	
1	11.0	9.5	8.0	7.5	---	---	.5	.5	.0	.0	.0	.0
2	10.5	9.0	8.0	7.5	---	---	.5	.5	.0	.0	.0	.0
3	11.0	8.5	7.5	7.0	---	---	.5	.5	.0	.0	.0	.0
4	10.5	8.5	7.0	5.5	---	---	.5	.5	.0	.0	.0	.0
5	10.0	9.5	5.5	4.0	---	---	.5	.5	.0	.0	.0	.0
6	9.5	8.0	6.0	4.5	---	---	.5	.5	.0	.0	.0	.0
7	8.0	7.0	7.0	6.0	---	---	.5	.5	.0	.0	.0	.0
8	7.0	7.0	8.0	7.0	---	---	.5	.5	.0	.0	.0	.0
9	8.0	7.0	9.0	8.0	---	---	.5	.5	.0	.0	.0	.0
10	8.0	7.0	9.0	5.5	---	---	.5	.5	.0	.0	.0	.0
11	8.0	8.0	5.5	3.5	---	---	.5	.5	.0	.0	.5	.0
12	8.0	7.0	3.5	2.5	---	---	.5	.5	.0	.0	1.0	.0
13	7.0	5.5	---	---	---	---	.5	.5	.0	.0	1.0	.5
14	8.0	6.5	---	---	---	---	.5	.5	.0	.0	.5	.5
15	7.5	7.0	---	---	---	---	.5	.5	.0	.0	2.0	.0
16	7.5	6.0	---	---	---	---	.0	.0	.0	.0	2.0	.0
17	7.5	5.5	---	---	---	---	.0	.0	.0	.0	.5	.0
18	7.5	7.0	---	---	---	---	.0	.0	.0	.0	.0	.0
19	8.5	7.0	---	---	---	---	.0	.0	.0	.0	1.5	.0
20	8.0	6.0	---	---	---	---	.0	.0	.0	.0	.0	.0
21	9.0	7.5	---	---	1.0	1.0	.0	.0	.0	.0	3.0	.0
22	8.0	6.0	---	---	1.0	.5	.0	.0	.0	.0	3.5	1.5
23	7.0	5.0	---	---	1.0	.5	.0	.0	.0	.0	3.0	.5
24	7.5	5.0	---	---	1.0	.5	.0	.0	.0	.0	1.5	.0
25	9.5	7.5	---	---	.5	.5	.0	.0	.0	.0	2.0	.0
26	9.5	8.5	---	---	.5	.5	.0	.0	.0	.0	2.5	.0
27	9.5	8.5	---	---	.5	.5	.0	.0	.0	.0	3.5	1.0
28	9.0	7.0	---	---	.5	.5	.0	.0	.0	.0	4.0	1.0
29	7.5	6.0	---	---	.5	.5	.0	.0	---	---	4.0	.5
30	7.5	6.0	---	---	.5	.5	.0	.0	---	---	3.5	1.0
31	7.5	6.5	---	---	.5	.5	.0	.0	---	---	2.5	2.0
MONTH	11.0	5.0					.5	.0	.0	.0	4.0	.0

## STREAMS TRIBUTARY TO LAKE SUPERIOR

47

04043050 TRAP ROCK RIVER NEAR LAKE LINDEN, MI--CONTINUED

## TEMPERATURE (DEG. C) OF WATER, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DAY	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN
	APRIL		MAY		JUNE		JULY		AUGUST		SEPTEMBER	
1	2.0	.5	8.0	4.5	13.0	11.5	18.0	15.0	17.5	13.0	17.0	13.5
2	2.0	.5	8.5	5.0	13.5	11.5	16.5	14.5	18.5	15.0	18.5	13.5
3	2.5	.5	10.0	6.0	15.0	10.5	19.0	13.0	17.5	13.5	17.5	15.0
4	3.5	2.0	10.0	6.5	13.5	12.0	18.0	14.5	18.0	13.5	17.5	13.5
5	3.0	1.0	10.5	6.5	16.0	11.0	18.0	14.0	19.0	14.5	17.0	14.5
6	2.0	.5	11.0	7.0	18.0	12.5	19.5	15.5	18.5	15.0	18.5	15.0
7	3.0	.5	11.5	7.5	16.0	10.5	19.0	16.5	19.5	14.5	18.0	15.0
8	2.5	.5	10.5	8.5	13.5	9.0	18.5	14.0	20.0	17.0	15.0	14.5
9	1.5	.5	9.0	7.5	14.5	10.5	17.0	14.0	19.0	15.5	16.0	14.0
10	1.0	.5	11.5	7.0	14.0	10.5	17.0	12.5	17.5	14.5	17.5	14.5
11	3.5	1.0	14.5	9.5	13.5	13.5	18.0	12.5	16.5	14.5	16.0	15.0
12	2.5	1.5	14.0	10.0	15.0	12.0	16.0	13.0	18.5	14.5	14.5	12.5
13	3.0	1.5	10.0	7.5	15.5	10.0	17.0	14.0	20.0	17.5	12.5	11.5
14	4.0	1.5	7.5	7.0	15.0	10.0	17.0	13.0	21.5	17.5	13.0	11.5
15	4.5	2.0	11.5	7.0	15.5	12.0	18.5	13.5	21.0	19.0	13.0	12.0
16	4.0	1.0	15.0	9.5	16.5	12.5	18.5	13.5	19.0	17.0	12.5	11.0
17	4.0	1.0	16.5	11.5	16.5	14.0	20.0	14.0	18.5	15.5	14.0	12.0
18	3.0	1.0	17.5	13.0	18.5	13.5	19.5	16.0	17.5	16.0	13.0	12.5
19	2.5	2.0	17.5	13.5	19.5	13.0	20.0	16.5	16.5	15.0	14.5	12.0
20	4.5	1.0	15.5	12.0	17.0	14.0	19.0	16.0	17.5	13.5	14.0	13.0
21	5.5	1.5	14.0	9.5	16.0	16.0	17.5	14.5	18.0	14.5	13.5	11.5
22	6.0	1.5	15.5	10.5	17.5	11.0	16.0	14.0	19.0	16.5	13.0	10.5
23	5.5	1.5	17.0	11.5	17.5	12.5	17.0	13.5	17.5	15.0	13.0	10.0
24	6.5	2.0	18.0	12.5	17.0	14.0	19.0	14.0	15.0	14.5	13.5	11.5
25	7.0	2.0	16.5	13.5	16.0	14.0	19.5	15.5	16.5	14.0	12.5	9.5
26	6.5	2.5	19.5	13.5	17.0	16.0	20.5	17.0	16.0	15.0	13.5	10.5
27	7.0	3.0	19.5	16.0	17.0	15.0	19.0	15.0	16.0	15.0	12.5	10.0
28	8.5	3.5	18.0	15.5	19.0	15.0	16.5	13.0	17.0	14.5	12.0	10.0
29	7.5	5.0	17.5	15.0	20.5	16.5	16.5	13.0	17.5	15.0	11.5	10.5
30	6.5	4.0	16.5	15.0	19.0	15.5	16.5	11.5	16.5	14.0	11.0	10.5
31	---	---	16.0	13.0	---	---	15.5	13.0	15.5	12.5	---	---
MONTH	8.5	.5	19.5	4.5	20.5	9.0	20.5	11.5	21.5	12.5	18.5	9.5

04044400 CARP RIVER NEAR NEGAUNEE, MI

LOCATION.--Lat 46°31'29", long 87°34'25", in SE¼ sec.29, T.48 N., R.26 W., Marquette County, Hydrologic Unit 04020105, on right bank 30 ft (9 m) downstream from bridge on U.S. Highway 41, and 2.0 mi (3.2 km) northeast of Negaunee.

DRAINAGE AREA.--51.4 mi<sup>2</sup> (133.1 km<sup>2</sup>).

PERIOD OF RECORD.--July 1961 to current year.

GAGE.--Water-stage recorder. Datum of gage is 1,319.90 ft (402.306 m) Michigan Department of Highway and Transportation datum. Prior to Aug. 24, 1961, nonrecording gage at same site and datum.

REMARKS.--Records good except those for the winter period, which are fair. Flow regulated by Deer Lake storage reservoir (capacity, 22,500 acre-ft or 27.7 hm<sup>3</sup>) 5 mi (8 km) above station. The city of Ishpeming diverted an average of 2.2 ft<sup>3</sup>/s (0.062 m<sup>3</sup>/s) into basin as waste effluent (station 04058200). Several observations of water temperature were made during the year.

**AVERAGE DISCHARGE.--**17 years, 59.8 ft<sup>3</sup>/s (1.694 m<sup>3</sup>/s).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 351 ft<sup>3</sup>/s (9.94 m<sup>3</sup>/s) June 27, 28, 1968, gage height, 4.68 ft (1.426 m); maximum gage height, 5.24 ft (1.597 m) Mar. 2, 1972, backwater from ice; minimum discharge, 3.7 ft<sup>3</sup>/s (0.10 m<sup>3</sup>/s) July 29, 1965; minimum gage height, 1.94 ft (0.591 m) Aug. 1, 1962; minimum daily discharge, 3.9 ft<sup>3</sup>/s (0.11 m<sup>3</sup>/s) July 29, 30, 1965.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 331 ft<sup>3</sup>/s (9.37 m<sup>3</sup>/s) Sept. 11, gage height, 4.68 ft (1.426 m); minimum, 14 ft<sup>3</sup>/s (0.396 m<sup>3</sup>/s) Apr. 2, gage height, 2.29 ft (0.698 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	56	63	67	94	112	133	21	59	64	52	58	59
2	55	65	71	94	112	55	19	55	62	52	59	57
3	52	72	59	94	112	36	19	58	60	51	60	58
4	51	77	61	100	112	34	20	59	60	50	58	56
5	50	71	60	115	112	35	24	52	62	51	56	56
6	51	68	64	115	112	34	28	45	58	50	55	55
7	51	69	59	115	112	34	32	40	60	54	54	55
8	76	62	70	115	112	35	36	51	65	63	55	54
9	112	60	72	54	112	35	35	61	61	58	59	55
10	80	59	70	100	112	38	35	74	57	55	59	56
11	76	63	70	115	112	58	38	73	61	53	58	226
12	80	61	70	115	112	58	38	98	79	51	59	245
13	73	59	69	115	130	57	38	89	65	51	59	123
14	64	59	69	115	140	57	32	212	58	50	58	94
15	62	65	69	115	140	57	28	156	56	50	61	92
16	62	74	69	115	138	57	32	98	60	49	80	78
17	60	75	69	115	142	57	44	77	72	49	77	69
18	64	71	68	115	138	56	53	67	93	53	72	64
19	62	67	67	115	137	57	59	61	71	62	73	61
20	58	72	65	115	139	57	54	60	61	87	73	63
21	56	99	67	115	138	56	41	58	60	79	68	76
22	59	116	66	115	134	56	44	55	57	66	64	88
23	60	70	65	115	130	57	64	52	56	67	92	88
24	60	69	67	115	124	56	81	50	55	64	104	88
25	59	66	58	115	129	56	98	49	55	61	88	87
26	59	66	69	114	123	56	103	50	55	60	75	88
27	59	66	70	112	125	57	114	49	54	57	81	104
28	63	66	71	112	125	55	133	89	53	57	113	102
29	62	66	71	112	---	19	136	69	52	65	99	101
30	62	65	71	112	---	19	77	66	51	64	77	103
31	62	---	96	112	---	19	---	67	---	60	63	---
TOTAL	1956	2081	2109	3395	3476	1546	1576	2199	1833	1791	2167	2601
MEAN	63.1	69.4	68.0	110	124	49.9	52.5	70.9	61.1	57.8	69.9	86.7
MAX	112	116	96	115	142	133	136	212	93	87	113	245
MIN	50	59	58	54	112	19	19	40	51	49	54	54
CAL YR 1977	TOTAL	17450	MEAN 47.8	MAX 146	MIN 11							
WTR YR 1978	TOTAL	26730	MEAN 73.2	MAX 245	MIN 19							



## STREAMS TRIBUTARY TO LAKE SUPERIOR

49

04045500 TAHQUAMENON RIVER NEAR TAHQUAMENON PARADISE, MI  
(National stream-quality accounting network and pesticide station)

LOCATION.--Lat 46°34'30", long 85°16'10", in NE¼ sec.11, T.48 N., R.8 W., Luce County, Hydrologic Unit 04020202, on left bank 0.7 mi (1.1 km) upstream from Tahquamenon (Big) Falls, 11.5 mi (18.5 km) west of Tahquamenon Paradise, and 19 mi (31 km) northeast of Newberry.

DRAINAGE AREA.--790 mi<sup>2</sup> (2,046 km<sup>2</sup>).

## WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--August 1953 to current year.

GAGE.--Water-stage recorder. Altitude of gage is 697 ft (212.4 m) from river-profile map (nearest ft).

REMARKS.--Water-discharge records good.

AVERAGE DISCHARGE.--25 years, 932 ft<sup>3</sup>/s (26.39 m<sup>3</sup>/s), 16.02 in/yr (407 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 6,990 ft<sup>3</sup>/s (198 m<sup>3</sup>/s) May 10, 1960, gage height, 10.26 ft (3.127 m); minimum, 157 ft<sup>3</sup>/s (4.45 m<sup>3</sup>/s) July 26, 1955; minimum gage height, 2.86 ft (0.872 m) July 7, 1963.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 4,200 ft<sup>3</sup>/s (119 m<sup>3</sup>/s) Apr. 28, 29, gage height, 8.35 ft (2.545 m); minimum, 278 ft<sup>3</sup>/s (7.87 m<sup>3</sup>/s) July 8, gage height, 3.26 ft (0.994 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT
1	1190	611	1100	820	487	487	585	3960	647	473	954	1760
2	1190	726	1020	789	490	486	626	3840	582	425	857	1700
3	1170	1050	960	751	494	484	664	3690	551	397	800	1630
4	1140	1480	900	714	501	482	694	3500	537	399	742	1590
5	1080	1750	860	686	502	479	746	3290	537	402	676	1530
6	1030	1950	810	664	505	475	852	3100	536	358	593	1440
7	983	2090	760	644	508	475	950	2910	501	309	553	1340
8	964	2160	710	626	508	474	1040	2750	540	293	508	1250
9	1100	2200	680	611	509	472	1140	2680	564	309	478	1170
10	1230	2250	640	590	508	468	1210	2610	577	305	465	1150
11	1380	2260	610	565	506	465	1310	2550	542	313	449	1280
12	1540	2320	580	553	505	463	1420	2500	767	322	427	1450
13	1680	2320	550	553	502	464	1490	2620	1080	307	402	1520
14	1750	2270	570	562	502	465	1550	2940	1240	323	395	1620
15	1740	2200	577	579	502	467	1600	3240	1310	319	373	1870
16	1720	2150	591	572	502	469	1670	3400	1340	330	390	1970
17	1670	2060	620	566	505	474	1810	3380	1360	338	402	2030
18	1570	1970	684	563	506	479	2030	3300	1420	314	426	2020
19	1470	1880	777	551	508	478	2280	3170	1410	311	495	1980
20	1370	1810	883	541	505	471	2540	2970	1320	496	646	1920
21	1250	1800	983	534	502	465	2760	2770	1200	688	685	1890
22	1140	1710	1050	530	502	464	3010	2560	1080	858	643	1810
23	1060	1650	1070	523	499	465	3260	2310	955	1120	683	1730
24	965	1590	1080	517	499	467	3540	2060	819	1320	919	1590
25	887	1440	1060	511	498	471	3790	1830	731	1440	1070	1460
26	802	1320	989	516	493	472	3990	1620	700	1480	1130	1370
27	746	1300	941	515	490	478	4100	1400	664	1450	1160	1280
28	697	1250	926	498	489	485	4170	1210	629	1400	1500	1260
29	665	1200	907	493	---	499	4160	1040	570	1290	1690	1240
30	636	1150	886	487	---	517	4100	870	522	1190	1750	1250
31	612	---	856	485	---	537	---	724	---	1070	1770	---
TOTAL	36427	51917	25630	18109	14027	14797	63087	80794	25231	20349	24031	47100
MEAN	1175	1731	827	584	501	477	2103	2606	841	656	775	1570
MAX	1750	2320	1100	820	509	537	4170	3960	1420	1480	1770	2030
MIN	612	611	550	485	487	463	585	724	501	293	373	1150
CFSM	1.49	2.19	1.05	.74	.63	.60	2.66	3.30	1.07	.83	.98	1.99
IN.	1.72	2.44	1.21	.85	.66	.70	2.97	3.80	1.19	.96	1.13	2.22
CAL YR 1977	TOTAL	411604	MEAN	1128	MAX	5550	MIN	237	CFSM	1.43	IN	19.38
WTR YR 1978	TOTAL	421499	MEAN	1155	MAX	4170	MIN	293	CFSM	1.46	IN	19.85

## 04045500 TAHQUAMENON RIVER NEAR TAHQUAMENON PARADISE, MI--CONTINUED

## WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1967, 1973 to current year.

PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE: October 1974 to current year.

WATER TEMPERATURES: October 1974 to current year.

INSTRUMENTATION.--Water-quality monitor since October 1975.

REMARKS.--Interruptions in the record were due to malfunctions of the instrument. Once daily specific conductance and temperature records are based on samples taken by local observer near monitor site. In addition to the water-quality monitor record, monthly samples are collected as a cross-section sample at cableway 40 ft (12 m) downstream from gage or by wading 300 ft (91 m) downstream.

COOPERATION.--Pesticide samples were collected by the U.S. Geological Survey and were analyzed by the U.S. Environmental Protection Agency.

EXTREMES FOR PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE: Maximum recorded (water years 1976-78), 238 micromhos Jan. 24, 1977; minimum recorded (water years 1976, 1978), 34 micromhos Apr. 17, 18, 1976.

WATER TEMPERATURES (water years 1976-78): Maximum recorded, 26.5°C May 21, 1977; minimum, 0.0°C on many days during winter periods.

EXTREMES FOR CURRENT YEAR.--

SPECIFIC CONDUCTANCE: Maximum recorded, 189 micromhos July 18; minimum recorded, 57 micromhos Apr. 27, 28.

WATER TEMPERATURES: Maximum recorded, 24.0°C July 2-4, Aug. 11-13, 19, 20; minimum, 0.0°C on many days during winter period.

## WATER QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DATE	TIME	STREAM- FLOW, INSTAN- TANEOUS (CFS)	SPE- CIFIC CON- DUCT- ANCE (MICRO- MHOS)	PH (UNITS)	TEMPER- ATURE (DEG C)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED SATUR- ATION	COLI- FORM, FECAL (PER- CENT UM-MF (COLS./ 100 ML)	STREP- TOCOCCI FECAL KF AGAR (COLS. PER 100 ML)	HARD- NESS, NONCAR- BONATE (MG/L CAC03)	HARD- NESS, NONCAR- BONATE (MG/L CAC03)
OCT											
11...	1500	1400	106	6.9	12.5	8.2	77	--	35	63	6
NOV											
08...	1330	2180	92	6.5	7.0	8.0	68	K8	34	49	21
DEC											
12...	1400	580	136	6.9	.0	9.5	67	K2	K5	69	18
JAN											
10...	1200	585	154	7.0	.0	9.8	69	K5	<1	68	19
FEB											
14...	1400	502	160	6.8	.0	6.0	42	K1	K110	76	12
MAR											
14...	1300	464	168	6.9	.0	6.1	44	K1	14	79	9
APR											
18...	1300	1960	97	6.8	1.5	8.6	63	<1	K5	44	12
MAY											
16...	1315	3420	73	6.8	12.0	7.4	71	K4	17	36	12
JUN											
14...	1530	1250	110	7.4	14.0	7.6	79	92	--	55	8
JUL											
24...	1330	1360	153	--	19.0	6.1	66	80	160	79	32
SEP											
06...	1230	1440	118	7.0	18.0	4.2	45	K11	68	63	15
27...	1115	1310	112	6.8	14.0	6.0	59	K13	K9	66	13

DATE	CALCIUM DIS- SOLVED (MG/L AS CA)	MAGNE- SIUM, DIS- SOLVED (MG/L AS MG)	SODIUM, DIS- SOLVED (MG/L AS NA)	SODIUM AD- SORP- TION RATIO	SODIUM PERCENT	POTAS- SIUM, DIS- SOLVED (MG/L AS K)	BICAR- BONATE (MG/L AS HCO3)	CAR- BONATE (MG/L AS CO3)	ALKA- LITY (MG/L AS CAC03)	CARBON DIOXIDE DIS- SOLVED (MG/L AS CO2)	SULFATE DIS- SOLVED (MG/L AS SO4)
OCT											
11...	18	4.4	1.5	.1	5	.8	70	0	57	14	13
NOV											
08...	14	3.4	1.0	.1	4	1.1	34	0	28	17	13
DEC											
12...	20	4.7	1.4	.1	4	.7	62	0	51	12	14
JAN											
10...	19	4.9	1.5	.1	5	.8	60	0	49	9.6	12
FEB											
14...	21	5.7	1.8	.1	5	.7	78	0	64	20	14
MAR											
14...	22	5.9	1.9	.1	5	.9	86	0	71	17	14
APR											
18...	12	3.3	1.4	.1	6	.9	38	0	31	9.6	14
MAY											
16...	10	2.7	1.2	.1	7	1.1	29	0	24	7.4	10
JUN											
14...	15	4.2	1.2	.1	4	.8	60	0	47	3.8	9.4
JUL											
24...	24	4.7	1.6	.1	4	.8	--	--	47	--	22
SEP											
06...	18	4.3	1.4	.1	5	.8	58	0	48	9.3	8.6
27...	18	5.1	1.5	.1	5	.6	65	0	53	16	8.5

K--RESULTS BASED ON COLONY COUNT OUTSIDE THE ACCEPTABLE RANGE (NON-IDEAL COLONY COUNT)

## STREAMS TRIBUTARY TO LAKE SUPERIOR

51

04045500 TAHQUAMENON RIVER NEAR TAHQUAMENON PARADISE, MI--CONTINUED

WATER-QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978--CONTINUED

DATE	CHLORIDE, DIS-SOLVED (MG/L AS CL)	FLUORIDE, DIS-SOLVED (MG/L AS F)	SILICA, DIS-SOLVED (MG/L AS SiO2)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L)	SOLIDS, SUM OF CONSTITUENTS, DIS-SOLVED (MG/L)	SOLIDS, DIS-SOLVED (TONS PER DAY)	NITROGEN, NO2+NO3 TOTAL (MG/L AS N)	NITROGEN, AMMONIA TOTAL (MG/L AS N)	NITROGEN, ORGANIC TOTAL (MG/L AS N)	NITROGEN+AMMONIA + ORGANIC TOTAL (MG/L AS N)
OCT 11...	3.1	.0	7.5	121	84	457	.06	.01	--	--
NOV 08...	2.7	.0	6.5	87	58	512	.08	.01	--	--
DEC 12...	1.9	.0	8.0	106	81	166	.13	.05	--	--
JAN 10...	2.5	.0	8.5	98	79	155	.13	.02	--	--
FEB 14...	2.0	.2	9.5	116	93	157	.15	.03	.20	.23
MAR 14...	1.7	.0	9.9	110	99	138	.13	.05	.62	.67
APR 18...	1.1	.0	6.8	80	59	423	.26	.02	.67	.69
MAY 16...	1.0	.0	2.3	76	43	702	.03	.01	.54	.55
JUN 14...	1.6	.1	4.8	96	95	324	.10	.04	.82	.86
JUL 24...	2.1	.0	6.1	128	90	470	.08	.01	.86	.87
SEP 06...	2.3	.0	7.4	121	71	470	.01	.00	.98	.98
27...	2.1	.1	7.1	107	75	378	.03	.03	.60	.63

DATE	NITROGEN, NH4 + ORG. SUSP. TOTAL (MG/L AS N)	NITROGEN, AMMONIA + ORGANIC DIS. (MG/L AS N)	NITROGEN, TOTAL (MG/L AS N)	NITROGEN, TOTAL (MG/L AS NO3)	PHOSPHORUS, TOTAL (MG/L AS P)	PHOSPHORUS, DIS-SOLVED (MG/L AS P)	CARBON, ORGANIC TOTAL (MG/L AS C)	SEDIMENT, SUSPENDED (MG/L)	SEDIMENT DISCHARGE, SUSPENDED (T/DAY)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM
OCT 11...	--	--	--	--	.02	--	--	5	19	100
NOV 08...	--	1.2	--	--	.01	.01	13	9	53	100
DEC 12...	--	.62	--	--	.02	.02	4.2	3	4.7	100
JAN 10...	--	.43	--	--	.02	.01	--	--	--	--
FEB 14...	.00	--	.38	1.7	.02	.01	8.4	1	1.4	100
MAR 14...	.26	.41	.80	3.5	.02	.01	11	1	1.3	100
APR 18...	.18	.51	.95	4.2	.01	.01	--	1	5.3	100
MAY 16...	.02	.53	.58	2.6	.02	.01	11	2	18	100
JUN 14...	.10	.76	.96	4.3	.03	.01	9.0	5	17	100
JUL 24...	.15	.72	.95	4.2	.02	.01	--	10	37	100
SEP 06...	.07	.91	.99	4.4	.02	.01	22	6	23	100
27...	.00	--	.66	2.9	.01	.01	15	--	--	--

## STREAMS TRIBUTARY TO LAKE SUPERIOR

04045500 TAHQUAMENON RIVER NEAR TAHQUAMENON PARADISE, MI--CONTINUED

## WATER-QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978--CONTINUED

DATE	TIME	ARSENIC TOTAL (UG/L AS AS)	ARSENIC DIS- SOLVED (UG/L AS AS)	BARIUM, TOTAL RECOV- ERABLE (UG/L AS BA)	BARIUM, DIS- SOLVED (UG/L AS BA)	CADMIUM TOTAL RECOV- ERABLE (UG/L AS CO)	CADMIUM DIS- SOLVED (UG/L AS CO)	CHRO- MIUM, TOTAL RECOV- ERABLE (UG/L AS CR)	CHRO- MIUM, DIS- SOLVED (UG/L AS CR)	COBALT, TOTAL RECOV- ERABLE (UG/L AS CO)
OCT 11...	1500	1	1	0	0	0	0	10	1	0
JAN 10...	1200	1	1	0	0	0	0	<10	1	0
APR 18...	1300	1	1	0	0	3	2	10	1	0
JUL 24...	1330	1	0	0	0	0	0	10	2	0

DATE	COBALT, DIS- SOLVED (UG/L AS CO)	COPPER, TOTAL RECOV- ERABLE (UG/L AS CU)	COPPER, DIS- SOLVED (UG/L AS CU)	IRON, TOTAL RECOV- ERABLE (UG/L AS FE)	IRON, DIS- SOLVED (UG/L AS FE)	LEAD, TOTAL RECOV- ERABLE (UG/L AS PB)	LEAD, DIS- SOLVED (UG/L AS PB)	MANGA- NESE, TOTAL RECOV- ERABLE (UG/L AS MN)	MANGA- NESE, DIS- SOLVED (UG/L AS MN)	MERCURY TOTAL RECOV- ERABLE (UG/L AS HG)
OCT 11...	0	4	4	1200	750	9	5	30	30	<.5
JAN 10...	0	8	2	970	500	8	7	40	30	<.5
APR 18...	0	7	4	690	390	23	18	30	20	<.5
JUL 24...	0	3	3	790	500	14	7	70	50	.5

DATE	MERCURY DIS- SOLVED (UG/L AS HG)	SELE- NIUM, TOTAL (UG/L AS SE)	SELE- NIUM, DIS- SOLVED (UG/L AS SE)	SILVER, TOTAL RECOV- ERABLE (UG/L AS AG)	SILVER, DIS- SOLVED (UG/L AS AG)	ZINC, TOTAL RECOV- ERABLE (UG/L AS ZN)	ZINC, DIS- SOLVED (UG/L AS ZN)	CARBON, ORGANIC DIS- SOLVED (MG/L AS C)	CARBON, ORGANIC SUS- PENDED TOTAL (MG/L AS C)
OCT 11...	<.5	0	0	0	0	0	0	--	.7
JAN 10...	<.5	0	0	0	0	20	10	--	.2
APR 18...	<.5	0	0	0	0	20	10	3.8	.6
JUL 24...	.5	0	0	0	0	30	30	17	.3

## PESTICIDE ANALYSES

DATE	TIME	PCP, TOTAL (UG/L)	ALDRIN, TOTAL (UG/L)	ALDRIN, TOTAL IN BOT- TOM MA- TERIAL (UG/KG)	ATRA- ZINE, TOTAL (UG/L)	ATRA- ZINE, TOTAL IN BOT- TOM MA- TERIAL (UG/KG)	CHLOR- DANE, TOTAL (UG/L)	CHLOR- DANE, TOTAL IN BOT- TOM MA- TERIAL (UG/KG)	DDD, TOTAL (UG/L)	DDD, TOTAL IN BOT- TOM MA- TERIAL (UG/KG)
NOV 08...	1330	ND	ND	ND	ND	ND	ND	ND	ND	ND
FEB 14...	1400	ND	ND	--	--	--	ND	--	ND	--
JUN 14...	1530	ND	ND	ND	ND	--	ND	1	ND	--
SEP 06...	1230	ND	ND	--	--	--	ND	--	ND	--

DATE	DDE, TOTAL (UG/L)	DDE, TOTAL IN BOT- TOM MA- TERIAL (UG/KG)	DDT, TOTAL (UG/L)	DDT, TOTAL IN BOT- TOM MA- TERIAL (UG/KG)	DI- AZINON, TOTAL (UG/L)	DI- AZINON, TOTAL IN BOT- TOM MA- TERIAL (UG/KG)	DI- ELDRIN, TOTAL (UG/L)	DI- ELDRIN, TOTAL IN BOT- TOM MA- TERIAL (UG/KG)	ENDRIN, TOTAL (UG/L)	ENDRIN, TOTAL IN BOT- TOM MA- TERIAL (UG/KG)
NOV 08...	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
FEB 14...	ND	--	ND	--	ND	--	ND	--	ND	--
JUN 14...	ND	--	ND	ND	ND	ND	ND	ND	ND	ND
SEP 06...	ND	--	ND	--	ND	--	ND	--	ND	--

ND--NOT DETECTED



## STREAMS TRIBUTARY TO LAKE SUPERIOR

53

04045500 TAHQUAMENON RIVER NEAR TAHQUAMENON PARADISE, MI

## WATER-QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978--CONTINUED

DATE	ETHION. TOTAL (UG/L)	ETHION. TOTAL IN BOT- TOM MA- TERIAL (UG/KG)	HEPTA- CHLOR. TOTAL (UG/L)	HEPTA- CHLOR. TOTAL IN BOT- TOM MA- TERIAL (UG/KG)	HEPTA- CHLOR. EPOXIDE TOTAL (UG/L)	HEPTA- CHLOR. EPOXIDE TOT. IN BOTTOM MATL. (UG/KG)	LINDANE TOTAL (UG/L)	LINDANE TOTAL IN BOT- TOM MA- TERIAL (UG/KG)	MALA- THION. TOTAL (UG/L)	MALA- THION. TOTAL IN BOT- TOM MA- TERIAL (UG/KG)
NOV 08...	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
FEB 14...	ND	--	ND	--	ND	--	ND	--	ND	--
JUN 14...	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SEP 05...	ND	--	ND	--	ND	--	ND	--	ND	--

DATE	METH- OXY- CHLOR. TOTAL (UG/L)	METH- OXY- CHLOR. TOT. IN BOTTOM MATL. (UG/KG)	METHYL PARA- THION. TOTAL (UG/L)	METHYL PARA- THION. TOT. IN BOTTOM MATL. (UG/KG)	METHYL TRI- THION. TOTAL (UG/L)	METHYL TRI- THION. TOT. IN BOTTOM MATL. (UG/KG)	PARA- THION. TOTAL (UG/L)	PARA- THION. TOTAL IN BOT- TOM MA- TERIAL (UG/KG)	SIMA- ZINE TOTAL COUL- SON COND. (UG/L)	SIMA- ZINE IN BOTTOM MATERI- AL (UG/ KG DRY SOLIDS)
NOV 08...	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
FEB 14...	ND	--	ND	--	ND	--	ND	--	--	--
JUN 14...	ND	ND	ND	ND	ND	ND	ND	ND	ND	--
SEP 06...	ND	--	ND	--	ND	--	ND	--	--	--

DATE	TOX- APHENE. TOTAL (UG/L)	TOX- APHENE. TOTAL IN BOT- TOM MA- TERIAL (UG/KG)	TOTAL TRI- THION (UG/L)	TRI- THION. TOTAL IN BOT- TOM MA- TERIAL (UG/KG)	2,4-D. TOTAL (UG/L)	2,4-D. TOTAL IN BOT- TOM MA- TERIAL (UG/KG)	2,4,5-T TOTAL (UG/L)	2,4,5-T TOTAL IN BOT- TOM MA- TERIAL (UG/KG)	SILVEX. TOTAL (UG/L)	SILVEX. TOTAL IN BOT- TOM MA- TERIAL (UG/KG)
NOV 08...	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
FEB 14...	ND	--	ND	--	--	--	--	--	--	--
JUN 14...	ND	ND	ND	ND	--	--	--	--	--	--
SEP 06...	ND	--	ND	--	--	--	--	--	--	--

QUALITATIVE AND ASSOCIATED QUANTITATIVE ANALYSES OF BIOLOGICAL DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
PERIPHYTON

DATE	TIME	LENGTH OF EXPO- SURE (DAYS)	PERI- PHYTON BIOMASS ASH WEIGHT G/50 M	PERI- PHYTON BIOMASS DRY WEIGHT G/50 M	CHLOR-A PERI- PHYTON CHROMO- GRAPHIC FLUOROM (MG/M2)	CHLOR-R PERI- PHYTON CHROMO- GRAPHIC FLUOROM (MG/M2)
NOV 08...	1330	28	1.02	1.18	.000	.000
FEB 14...	1400	35	.000	.315	.000	.000
MAY 16...	1315	28	2.44	2.91	.790	.080

ND--NOT DETECTED

## STREAMS TRIBUTARY TO LAKE SUPERIOR

04045500 TAHQUAMENON RIVER NEAR TAHQUAMENON PARADISE, MI

SPECIFIC CONDUCTANCE (MICROMHOS/CM AT 25 DEG. C), WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
	OCTOBER			NOVEMBER			DECEMBER			JANUARY		
1	---	---	---	137	130	133	102	93	98	---	---	---
2	---	---	---	136	129	132	102	94	98	---	---	---
3	---	---	---	134	114	124	110	100	105	---	---	---
4	---	---	---	118	100	107	114	106	109	---	---	---
5	---	---	---	101	92	95	114	106	110	---	---	---
6	122	120	121	98	92	95	113	103	109	---	---	---
7	122	120	121	99	93	96	114	104	108	---	---	---
8	121	120	120	97	76	89	---	---	---	---	---	---
9	120	118	120	81	76	79	---	---	---	---	---	---
10	119	107	113	85	79	83	---	---	---	151	151	151
11	108	103	106	84	77	82	---	---	---	152	150	151
12	107	103	105	83	78	80	---	---	---	152	150	151
13	103	97	100	83	78	81	---	---	---	153	151	152
14	98	95	96	84	79	81	---	---	---	152	150	151
15	100	97	99	82	79	80	---	---	---	152	150	151
16	100	97	98	81	77	79	---	---	---	154	150	152
17	102	98	100	81	73	77	---	---	---	157	151	154
18	103	97	101	81	77	80	---	---	---	156	154	155
19	105	99	102	83	78	80	---	---	---	157	155	156
20	108	103	106	84	79	81	---	---	---	157	156	157
21	111	105	108	85	79	82	---	---	---	157	156	157
22	114	108	112	89	84	86	---	---	---	158	156	157
23	116	110	113	90	84	88	---	---	---	157	156	157
24	120	115	117	94	88	91	---	---	---	159	157	158
25	119	114	117	97	89	94	---	---	---	160	157	159
26	128	118	122	99	94	97	---	---	---	160	158	159
27	132	123	127	102	96	99	---	---	---	161	158	160
28	133	123	129	105	98	102	---	---	---	160	159	160
29	133	126	130	107	100	104	---	---	---	161	159	160
30	134	126	129	108	92	101	---	---	---	161	160	160
31	135	125	131	---	---	---	---	---	---	160	159	159

SPECIFIC CONDUCTANCE (MICROMHOS/CM AT 25 DEG. C), WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
FEBRUARY			MARCH			APRIL			MAY			
1	159	155	157	165	158	161	---	---	---	68	66	67
2	155	153	154	164	156	160	---	---	---	70	68	69
3	154	153	153	159	156	158	---	---	---	71	68	69
4	158	154	157	163	158	161	---	---	---	71	69	70
5	159	157	158	162	156	160	---	---	---	73	70	72
6	161	159	161	164	156	160	---	---	---	76	68	72
7	161	160	161	165	158	161	---	---	---	70	67	68
8	161	159	160	166	150	160	---	---	---	73	69	71
9	161	159	160	158	153	156	---	---	---	75	71	73
10	159	158	159	168	156	161	---	---	---	76	73	75
11	160	157	158	168	149	158	---	---	---	77	74	75
12	159	157	158	171	156	165	---	---	---	83	76	79
13	159	157	158	174	163	168	---	---	---	76	73	75
14	161	158	159	182	165	174	---	---	---	72	67	70
15	160	158	159	180	162	171	---	---	---	66	64	65
16	159	157	159	---	---	---	---	---	---	71	66	69
17	160	158	159	---	---	---	---	---	---	69	66	68
18	159	158	158	---	---	---	---	---	---	---	---	---
19	161	158	160	---	---	---	94	84	87	---	---	---
20	161	159	160	---	---	---	84	76	79	---	---	---
21	163	159	162	---	---	---	79	74	76	---	---	---
22	164	159	162	---	---	---	83	71	75	---	---	---
23	161	158	159	---	---	---	83	66	68	93	71	78
24	160	157	158	---	---	---	66	58	62	97	74	82
25	160	156	158	---	---	---	65	59	62	109	91	99
26	159	157	158	---	---	---	62	59	60	---	---	---
27	160	157	158	---	---	---	60	57	58	121	94	107
28	161	156	159	---	---	---	61	57	59	147	121	134
29	---	---	---	---	---	---	64	59	62	168	149	159
30	---	---	---	---	---	---	68	63	65	178	167	173
31	---	---	---	---	---	---	---	---	---	177	177	177

## 04045500 TAHQUAMENON RIVER NEAR TAHQUAMENON PARADISE, MI--CONTINUED

SPECIFIC CONDUCTANCE (MICROMHOS/CM AT 25 DEG. C), WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DAY	MAX	MIN	MEAN	ONCE-DAILY		MAX	MIN	MEAN	ONCE-DAILY	
				JUNE	JULY				AUGUST	SEPTEMBER
1	176	172	175		122	133	127	129		---
2	171	103	114		138	134	131	133		---
3	112	104	108		139	137	131	134		---
4	---	---	---		142	138	133	135		---
5	113	102	108		146	139	134	137		---
6	113	109	110		154	143	137	139		117
7	135	112	120		159	157	144	148		120
8	137	134	134		160	158	145	150		118
9	145	98	107		160	154	146	150		124
10	101	92	97		162	158	148	153		127
11	99	90	95		165	162	151	156		123
12	102	86	94		167	164	152	158		104
13	108	101	104		172	171	157	163		97
14	---	---	---		176	167	155	161		99
15	---	---	---		184	163	142	152		91
16	---	---	---		184	169	147	160		100
17	---	---	---		184	159	149	153		102
18	---	---	---		189	164	154	160		99
19	---	---	---		184	173	159	167		96
20	---	---	---		184	172	157	164		108
21	---	---	---		178	171	160	165		108
22	---	---	---		174	170	145	154		104
23	---	---	---		173	---	---	---		105
24	---	---	---		136	---	---	---		110
25	---	---	---		121	---	---	---		110
26	---	---	---		118	---	---	---		111
27	---	---	---		118	---	---	---		110
28	---	---	---		117	---	---	---		112
29	---	---	---		122	---	---	---		106
30	---	---	---		127	---	---	---		110
31	---	---	---		132	---	---	---		---

TEMPERATURE (DEG. C) OF WATER, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
	OCTOBER			NOVEMBER			DECEMBER			JANUARY		
1	---	---	---	10.5	9.5	10.5				---	---	---
2	---	---	---	10.5	9.0	10.0				---	---	---
3	---	---	---	10.5	9.0	9.5				---	---	---
4	---	---	---	12.0	10.5	11.0				---	---	---
5	---	---	---	11.5	9.5	11.0				---	---	---
6	11.5	10.5	11.0	10.5	8.0	9.0				---	---	---
7	12.5	11.0	11.5	9.5	7.0	8.0				---	---	---
8	13.0	11.5	12.0	8.0	6.5	7.0				---	---	---
9	12.5	10.5	12.0	9.0	7.0	7.5				---	---	---
10	12.0	10.5	11.5	11.0	8.0	9.5				.5	.0	.0
11	13.0	11.5	12.5	11.5	8.0	10.0				.0	.0	.0
12	12.5	11.5	12.0	10.0	6.5	8.5				.0	.0	.0
13	13.5	11.5	12.5	7.5	3.5	6.0				.0	.0	.0
14	12.5	11.0	12.0	4.5	2.0	3.5				.0	.0	.0
15	12.5	11.0	12.0	4.5	2.0	2.5				.0	.0	.0
16	13.0	11.5	12.0	4.0	1.5	2.5				.0	.0	.0
17	12.5	10.5	12.0	5.0	2.5	3.0				.0	.0	.0
18	12.0	9.5	10.5	4.0	2.5	3.0				.0	.0	.0
19	11.5	9.5	10.5	4.0	2.0	2.5				.0	.0	.0
20	12.5	10.5	11.5	6.0	2.0	4.0				.0	.0	.0
21	12.0	10.0	11.0	6.0	2.0	3.5				.0	.0	.0
22	11.5	9.0	10.5	5.0	2.0	4.0				.0	.0	.0
23	10.5	9.5	10.0	4.0	.5	2.0				.0	.0	.0
24	11.0	9.5	10.0	1.0	.5	.5				.0	.0	.0
25	11.5	10.0	11.0	1.5	.0	1.0				.0	.0	.0
26	11.5	9.0	10.0	1.0	.0	.5				.0	.0	.0
27	12.5	9.5	11.0	4.0	.0	1.0				.0	.0	.0
28	12.0	10.0	11.0	2.5	.5	1.0				.0	.0	.0
29	13.0	10.5	12.0	3.0	.5	2.0				.0	.0	.0
30	12.5	10.0	11.5	3.0	.5	2.0				.0	.0	.0
31	11.0	9.5	10.5	---	---	---				.0	.0	.0

## STREAMS TRIBUTARY TO LAKE SUPERIOR

04045500 TAMQUAMENON RIVER NEAR TAMQUAMENON PARADISE, MI--CONTINUED

TEMPERATURE (DEG. C) OF WATER, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
FEBRUARY			MARCH			APRIL			MAY			
1	.0	.0	.0	.0	.0	.0	---	---	---	10.0	10.0	10.0
2	.0	.0	.0	.0	.0	.0	---	---	---	10.0	9.5	9.5
3	.0	.0	.0	.0	.0	.0	---	---	---	10.5	9.5	10.0
4	.0	.0	.0	.0	.0	.0	---	---	---	11.5	10.5	11.0
5	.0	.0	.0	.0	.0	.0	---	---	---	12.5	11.5	12.0
6	.0	.0	.0	.0	.0	.0	---	---	---	13.5	12.5	13.0
7	.0	.0	.0	.0	.0	.0	---	---	---	14.0	12.5	13.5
8	.0	.0	.0	.0	.0	.0	---	---	---	13.5	13.5	13.5
9	.0	.0	.0	.5	.0	.0	---	---	---	13.5	12.5	13.0
10	.0	.0	.0	.5	.0	.0	---	---	---	12.5	12.0	12.0
11	.0	.0	.0	.0	.0	.0	---	---	---	13.0	12.0	12.5
12	.0	.0	.0	.0	.0	.0	---	---	---	14.0	12.5	13.0
13	.0	.0	.0	.0	.0	.0	---	---	---	13.5	12.0	12.5
14	.0	.0	.0	1.0	.0	.0	---	---	---	12.5	11.0	11.5
15	.0	.0	.0	1.0	.0	.0	---	---	---	12.0	10.5	11.0
16	.0	.0	.0	---	---	---	---	---	---	14.0	11.5	13.0
17	.0	.0	.0	---	---	---	---	---	---	16.0	13.5	15.0
18	.0	.0	.0	---	---	---	---	---	---	---	---	---
19	.0	.0	.0	---	---	---	2.0	1.0	1.5	---	---	---
20	.0	.0	.0	---	---	---	1.5	.5	1.0	---	---	---
21	.0	.0	.0	---	---	---	2.5	.5	1.5	---	---	---
22	.0	.0	.0	---	---	---	3.5	2.0	2.0	---	---	---
23	.0	.0	.0	---	---	---	3.5	2.0	3.0	---	---	---
24	.0	.0	.0	---	---	---	5.0	3.0	4.0	---	---	---
25	.0	.0	.0	---	---	---	7.0	4.5	5.5	---	---	---
26	.0	.0	.0	---	---	---	7.5	6.0	6.5	---	---	---
27	.0	.0	.0	---	---	---	8.0	7.0	7.5	---	---	---
28	.0	.0	.0	---	---	---	9.5	8.0	9.0	---	---	---
29	---	---	---	---	---	---	10.5	9.5	10.0	---	---	---
30	---	---	---	---	---	---	10.5	10.0	10.5	---	---	---
31	---	---	---	---	---	---	---	---	---	---	---	---

TEMPERATURE (DEG. C) OF WATER, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DAY	MAX	MIN	MEAN	ONCE DAILY	MAX	MIN	MEAN	ONCE DAILY
JUNE			JULY			AUGUST		
1	---	---	---	22.0	18.0	16.5	17.0	---
2	---	---	---	24.0	18.0	16.5	17.5	---
3	---	---	---	24.0	17.0	16.0	16.5	---
4	---	---	---	24.0	18.0	15.5	17.0	---
5	17.5	15.5	16.5	23.0	18.5	17.0	17.5	---
6	---	---	---	22.0	19.5	18.0	19.0	18.0
7	---	---	---	22.5	20.5	18.5	19.0	17.0
8	---	---	---	23.0	21.0	18.5	20.0	17.0
9	16.0	15.0	15.0	22.0	23.0	19.5	21.0	17.0
10	15.0	15.0	15.0	22.5	23.5	20.0	21.5	17.0
11	15.5	15.0	15.0	20.0	24.0	20.5	22.5	17.0
12	---	---	---	20.5	24.0	20.5	22.0	16.0
13	---	---	---	21.0	24.0	22.0	23.0	15.5
14	---	---	---	21.0	---	---	---	14.5
15	---	---	---	20.0	---	---	---	13.5
16	---	---	---	20.5	---	---	---	13.0
17	---	---	---	21.0	---	---	---	13.0
18	---	---	---	20.5	---	---	---	14.0
19	---	---	---	20.0	24.0	23.0	23.5	13.5
20	---	---	---	21.0	24.0	21.0	22.5	14.0
21	---	---	---	20.0	23.0	21.0	21.5	14.0
22	---	---	---	20.0	22.0	20.0	21.0	---
23	---	---	---	19.0	---	---	---	13.0
24	---	---	---	19.0	---	---	---	13.0
25	---	---	---	18.5	---	---	---	13.0
26	---	---	---	19.0	---	---	---	13.0
27	---	---	---	19.0	---	---	---	13.0
28	---	---	---	18.0	---	---	---	12.0
29	---	---	---	18.5	---	---	---	13.0
30	---	---	---	18.0	---	---	---	12.5
31	---	---	---	18.5	---	---	---	---



04045580 ST. MARYS RIVER ABOVE SAULT STE. MARIE, MI  
(National stream-quality accounting network and radiochemical station)

LOCATION.--Lat 46°29'29", long 84°25'17", in NW¼ sec.10, T.47 N., R.1 W., Chippewa County, Hydrologic Unit 04020300, at Sault Ste. Marie municipal raw-water intake at Big Point, 1 mi (1.6 km) west of Sault Ste. Marie.

DRAINAGE AREA.--80,900 mi<sup>2</sup> (210,000 km<sup>2</sup>), approximately.

PERIOD OF RECORD.--Water year 1970 to current year.

PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE: March 1974 to current year.

WATER TEMPERATURES: March 1974 to current year.

REMARKS.--Primary sampling point is at raw-water tap in Sault Ste. Marie municipal water plant at Big Point. Intake is 1,500 ft (457 m) out at a depth of 30 ft (9 m), 10 ft (3 m) above the bottom of the channel. Discharge estimates obtained from U.S. Army Corps of Engineers, Sault Ste. Marie.

EXTREMES FOR PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE: Maximum observed, 100 micromhos Oct. 23, 1974, Feb. 15, 1978; minimum daily, 76 micromhos Apr. 24, 1975.

WATER TEMPERATURES: Maximum daily, 20.5°C Aug. 22-28, 1976, July 28, 1977; minimum daily, 0.0°C Mar. 14, 15, 1974.

EXTREMES OUTSIDE PERIOD OF DAILY RECORD.--A specific conductance of 100 micromhos was observed Jan. 29, 1974.

EXTREMES FOR CURRENT YEAR.--

SPECIFIC CONDUCTANCE: Maximum observed, 100 micromhos Feb. 15; minimum observed, 88 micromhos Oct. 12.

WATER TEMPERATURES: Maximum daily, 20.0°C July 18, Aug. 15-19, Sept. 6, 7; minimum daily, 1.5°C on several days during January and February.

WATER QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DATE	TIME	STREAM- FLOW, INSTAN- TANEOUS (CFS)	SPE- CIFIC CON- DUCT- ANCE (MICRO- MHOS)	PH (UNITS)	TEMPER- ATURE (DEG C)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED SATUR- ATION	COI I- FORM, FECAL, 0.7 UM-WF (COLS./ 100 ML)	STREP- TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML)	HARD- NESS (MG/L AS CAC03)	HARD- NESS, NONCAR- BONATE (MG/L CAC03)
OCT											
12...	1000	E97800	88	7.1	13.5	11.8	95	--	K3	47	2
NOV											
09...	0900	E111000	93	7.0	11.0	11.0	98	K6	K4	44	3
DEC											
13...	1430	E900000	90	7.1	5.0	12.9	91	<1	K2	46	5
JAN											
11...	0800	F77600	90	7.5	2.5	--	--	<1	<1	47	4
FEB											
15...	1500	F77300	100	6.9	2.0	13.3	93	<1	<1	47	6
MAR											
15...	0900	F76100	98	7.4	2.5	13.2	93	<1	<1	43	0
APR											
19...	0830	F76400	91	7.1	5.0	12.2	88	K1	<1	44	0
MAY											
17...	1530	F81900	91	7.4	9.5	9.2	100	<1	K2	44	1
JUN											
15...	1500	F84800	94	7.5	12.5	10.5	105	19	--	41	8
JUL											
25...	1315	E86400	94	--	19.0	9.4	109	K4	K1	46	7
SEP											
07...	1315	F93000	97	7.3	20.0	9.9	100	K1	K2	46	5
28...	1145	E97400	96	7.0	16.0	10.5	102	K2	K2	43	1

DATE	CALCIUM DIS- SOLVED (MG/L AS CA)	MAGNE- SIUM, DIS- SOLVED (MG/L AS MG)	SODIUM, DIS- SOLVED (MG/L AS NA)	SODIUM AD- SORP- TION RATIO	SODIUM PERCENT	POTAS- SIUM, DIS- SOLVED (MG/L AS K)	BICAR- BONATE (MG/L AS HCO3)	CAR- BONATE (MG/L AS CO3)	ALKA- LINITY (MG/L AS CAC03)	CARBON DIOXIDE DIS- SOLVED (MG/L AS CO2)	SULFATE DIS- SOLVED (MG/L AS SO4)
OCT											
12...	14	2.8	1.4	.1	6	.6	54	0	44	6.9	3.1
NOV											
09...	13	2.7	1.0	.1	5	.7	50	0	41	8.0	3.2
DEC											
13...	14	2.6	1.0	.1	4	.7	50	0	41	6.4	3.2
JAN											
11...	14	2.9	1.2	.1	5	.6	52	0	43	2.6	2.7
FEB											
15...	14	2.8	1.5	.1	6	.5	50	0	41	10	3.5
MAR											
15...	13	2.6	1.3	.1	6	.6	56	0	46	3.6	3.7
APR											
19...	13	2.7	1.4	.1	6	.7	58	0	48	7.4	5.0
MAY											
17...	13	2.8	1.4	.1	6	.7	52	0	43	3.3	3.5
JUN											
15...	12	2.7	1.2	.1	6	.7	52	0	33	2.6	3.5
JUL											
25...	14	2.7	1.2	.1	5	.7	--	--	39	--	2.9
SEP											
07...	14	2.7	1.3	.1	6	.6	50	0	41	4.0	4.0
28...	14	2.0	1.5	.1	7	.5	51	0	42	8.2	2.5

E--ESTIMATED VALUE

K--RESULTS BASED ON COLONY COUNT OUTSIDE THE ACCEPTABLE RANGE (NON-IDEAL COUNT)

STREAMS TRIBUTARY TO ST. MARYS RIVER  
04045580 ST. MARYS RIVER ABOVE SAULT STE.MARIE, MI--CONTINUED

WATER-QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978--CONTINUED

DATE	CHLO- RIDE, DIS- SOLVED (MG/L AS CL)	FLUO- RIDE, DIS- SOLVED (MG/L AS F)	SILICA, DIS- SOLVED (MG/L AS SI02)	SOLIDS, RESIDUE AT 180 DEG. C DIS- SOLVED (MG/L)	SOLIDS, SUM OF CONSTI- TUENTS, DIS- SOLVED (MG/L)	SOLIDS, DIS- SOLVED (TONS PER DAY)	NITRO- GEN, NO2+NO3 TOTAL (MG/L AS N)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N)	NITRO- GEN, ORGANIC TOTAL (MG/L AS N)
OCT									
12...	1.9	.0	2.3	58	53	E15300	.26	.00	--
NOV									
09...	1.2	.0	2.4	54	49	E16200	.29	.01	--
DEC									
13...	1.4	.0	2.3	62	50	E15100	.31	.15	--
JAN									
11...	1.3	.0	2.3	52	51	E10900	.29	.00	--
FEB									
15...	1.4	.1	2.3	55	51	E11500	.27	.01	--
MAR									
15...	1.2	.0	2.4	53	52	E10900	.29	.02	.13
APR									
19...	.9	.1	2.5	54	55	E10100	.31	.00	.13
MAY									
17...	1.0	.0	2.3	56	50	E12400	.25	.00	.20
JUN									
15...	1.4	.1	2.2	60	69	E13700	.27	.00	.20
JUL									
25...	1.4	.0	2.2	50	49	E11700	.39	.00	.25
SEP									
07...	1.2	.0	2.0	63	50	E15800	.25	.00	.11
28...	1.1	.1	2.2	48	49	E12600	.26	.01	.12

DATE	NITRO- GEN,AM- MONIA + ORGANIC TOTAL (MG/L AS N)	NITRO- GEN,NH4 + ORG. SUSP. TOTAL (MG/L AS N)	NITRO- GEN,AM- MONIA + ORGANIC DIS. TOTAL (MG/L AS N)	NITRO- GEN, TOTAL (MG/L AS N)	NITRO- GEN, TOTAL (MG/L AS NO3)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, DIS- SOLVED (MG/L AS P)	CARBON, ORGANIC TOTAL (MG/L AS C)
OCT								
12...	--	--	.20	--	--	.00	.01	--
NOV								
09...	--	--	.13	--	--	.00	.00	11
DEC								
13...	--	--	.17	--	--	.00	.00	4.6
JAN								
11...	--	--	.11	--	--	.00	.00	--
FEB								
15...	--	--	.05	--	--	.00	.00	1.3
MAR								
15...	.15	.00	.16	.44	1.9	.00	.00	4.6
APR								
19...	.13	.00	.19	.44	1.9	.00	.00	--
MAY								
17...	.20	--	.16	.45	2.0	.00	.00	8.0
JUN								
15...	.20	.07	.13	.47	2.1	.00	.00	8.2
JUL								
25...	.25	.01	.24	.64	2.8	.01	.00	--
SEP								
07...	.11	.00	--	.36	1.6	.00	.00	4.0
28...	.13	.04	.09	.39	1.7	.00	.00	5.5

E--ESTIMATED VALUE

STREAMS TRIBUTARY TO ST. MARYS RIVER

59

04045580 ST. MARYS RIVER ABOVE SAULT STE.MARIE, MI--CONTINUED

WATER-QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978--CONTINUED

DATE	TIME	ARSENIC TOTAL (UG/L AS AS)	ARSENIC DTS- SOLVED (UG/L AS AS)	RADIUM, TOTAL RECOV- ERABLE (UG/L AS RA)	RADIUM, DTS- SOLVED (UG/L AS RA)	CADMIUM TOTAL RECOV- ERABLE (UG/L AS CD)	CADMIUM DTS- SOLVED (UG/L AS CD)	CHRO- MIUM, TOTAL RECOV- ERABLE (UG/L AS CR)	CHRO- MIUM, DTS- SOLVED (UG/L AS CR)	CORAL T, TOTAL RECOV- ERABLE (UG/L AS CO)
OCT										
12...	1000	0	0	0	0	0	--	<10	1	0
JAN										
11...	0800	1	1	0	0	--	1	10	4	0
APR										
10...	0830	2	1	0	0	0	0	10	0	0
JUL										
25...	1315	0	0	0	0	0	0	10	2	0

DATE	CORAL T, DTS- SOLVED (UG/L AS CO)	COPPER, TOTAL RECOV- ERABLE (UG/L AS CU)	COPPER, DTS- SOLVED (UG/L AS CU)	IRON, TOTAL RECOV- ERABLE (UG/L AS FE)	IRON, DTS- SOLVED (UG/L AS FE)	LEAD, TOTAL RECOV- ERABLE (UG/L AS PB)	LEAD, DTS- SOLVED (UG/L AS PB)	MANGA- NESE, TOTAL RECOV- ERABLE (UG/L AS MN)	MANGA- NESE, DTS- SOLVED (UG/L AS MN)	MERCURY TOTAL RECOV- ERABLE (UG/L AS HG)
OCT										
12...	0	3	3	50	20	--	--	0	0	<.5
JAN										
11...	0	7	3	50	40	9	8	0	0	<.5
APR										
12...	0	4	3	140	40	14	4	10	0	<.5
JUL										
25...	0	5	3	60	30	0	0	10	0	.5

DATE	MERCURY DTS- SOLVED (UG/L AS HG)	SILF- NIUM, TOTAL (UG/L AS SF)	SILF- NIUM, DTS- SOLVED (UG/L AS SF)	SILVER, TOTAL RECOV- ERABLE (UG/L AS AG)	SILVER, DTS- SOLVED (UG/L AS AG)	ZINC, TOTAL RECOV- ERABLE (UG/L AS ZN)	ZINC, DTS- SOLVED (UG/L AS ZN)	CARBON, ORGANIC DTS- SOLVED (MG/L AS C)	CARBON, ORGANIC SUS- PENDED TOTAL (MG/L AS C)
OCT									
12...	<.5	0	0	0	0	10	0	--	1.7
JAN									
11...	<.5	0	0	0	0	50	40	--	.2
APR									
10...	<.5	0	0	--	0	20	20	3.7	1.0
JUL									
25...	.5	0	0	0	0	90	70	2.3	.4

STREAMS TRIBUTARY TO ST. MARYS RIVER  
04045580 ST. MARYS RIVER ABOVE SAULT STE.MARIE, MI--CONTINUED

WATER-QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978--CONTINUED

DATE	TIME	GROSS ALPHA, DIS- SOLVED (UG/L AS U-NAT)	GROSS ALPHA, SUSP. TOTAL (UG/L AS U-NAT)	GROSS BETA, DIS- SOLVED (PCI/L AS CS-137)	GROSS BETA, SUSP. TOTAL (PCI/L AS CS-137)	GROSS BETA, DIS- SOLVED (PCI/L AS SR/ YT-90)	GROSS BETA, SUSP. TOTAL (PCI/L AS SR/ YT-90)	RADIUM 226, DIS- SOLVED, RADON METHOD (PCI/L)	URANIUM DIS- SOLVED, EXTRAC- TION (UG/L)
OCT 12...	1000	<.5	<.4	1.9	.7	1.6	.6	.03	.02
FEB 15...	1500	<.4	<.4	1.9	<.4	1.7	<.4	.10	<.01

QUALITATIVE AND ASSOCIATED QUANTITATIVE ANALYSES OF BIOLOGICAL DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
PERIPHYTON

DATE	TIME	LENGTH OF EXPO- SURE (DAYS)	PERI- PHYTON BIOMASS ASH WEIGHT G/SQ M	PERI- PHYTON BIOMASS TOTAL DRY WEIGHT G/SQ M	CHLOR-A PERI- PHYTON CHROMO- GRAPHIC FLUOROM (MG/M2)	CHLOR-B PERI- PHYTON CHROMO- GRAPHIC FLUOROM (MG/M2)
NOV 09...	0900	28	.157	.236	.210	.000



STREAMS TRIBUTARY TO ST. MARYS RIVER  
04045580 ST. MARYS RIVER ABOVE SAULT STE.MARIE, MI--CONTINUED

61

SPECIFIC CONDUCTANCE (MICROMHOS/CM AT 25 DEG. C), WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
ONCE-DAILY

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	93	92	93	93	94	95	94	92	94	94	93	95
2	93	93	93	93	94	94	94	92	94	94	93	95
3	93	93	92	93	94	95	95	92	93	94	93	94
4	93	93	92	93	94	95	95	92	94	93	93	94
5	93	93	93	94	94	94	96	92	94	93	93	94
6	93	92	93	95	94	94	96	92	93	93	93	93
7	92	93	93	95	94	95	96	93	93	94	93	93
8	93	94	93	94	93	95	96	93	93	94	93	93
9	92	93	92	93	93	95	96	93	93	94	93	93
10	93	93	93	94	94	95	96	93	93	93	93	93
11	93	93	93	95	93	94	96	93	93	93	93	93
12	93	93	93	94	93	95	95	94	93	94	93	93
13	92	93	92	95	93	96	95	93	94	93	93	93
14	92	93	93	94	94	96	94	93	94	93	93	95
15	93	93	93	96	94	95	94	93	94	93	93	94
16	93	93	93	94	94	95	94	93	93	93	94	94
17	93	93	93	93	95	95	94	93	93	93	94	93
18	93	92	93	93	94	95	93	93	93	93	93	93
19	93	93	93	94	94	94	92	93	93	93	93	96
20	93	93	93	93	94	95	93	93	93	93	96	94
21	93	93	93	94	94	95	93	93	93	94	97	93
22	93	93	93	94	95	94	93	93	93	94	94	93
23	93	93	93	93	95	95	93	93	93	94	94	93
24	93	93	93	93	97	95	93	94	93	95	93	94
25	93	93	93	94	94	95	93	94	94	93	93	94
26	93	93	93	95	94	95	94	94	93	93	93	94
27	93	93	93	94	94	95	94	94	93	93	93	94
28	93	93	94	94	95	95	96	94	93	93	91	95
29	93	93	93	94	---	94	98	95	93	94	92	94
30	93	93	93	94	---	95	94	96	93	93	93	94
31	93	---	93	94	---	94	---	95	---	93	95	---

TEMPERATURE (DEG. C) OF WATER, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
ONCE-DAILY

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	15.5	12.5	7.0	2.5	1.5	2.5	3.5	6.0	13.5	15.0	17.0	18.5
2	16.0	12.5	7.0	2.5	1.5	2.5	3.5	6.0	13.5	15.0	17.5	18.5
3	16.0	12.5	6.5	2.5	1.5	2.5	3.0	6.0	10.5	15.0	17.0	19.5
4	17.0	12.5	6.5	2.5	1.5	2.5	3.0	6.0	10.5	15.5	17.0	19.5
5	15.5	12.0	6.0	2.5	1.5	2.5	3.0	6.0	10.5	16.5	17.0	19.5
6	15.5	11.5	5.5	2.5	1.5	2.5	3.0	6.0	11.0	16.5	17.5	20.0
7	15.5	12.0	5.0	2.5	1.5	2.5	3.5	7.0	11.5	16.5	18.0	20.0
8	14.5	12.5	5.5	2.5	1.5	2.5	3.5	7.0	12.5	17.5	18.5	18.5
9	14.5	11.5	5.5	2.5	2.0	2.5	3.5	7.0	12.5	17.5	18.0	18.5
10	14.0	10.5	4.0	2.5	1.5	2.5	3.0	7.0	12.5	17.5	18.0	18.5
11	13.5	10.5	4.5	2.5	1.5	3.0	3.0	7.0	12.5	17.5	18.0	18.5
12	14.0	9.5	4.5	2.5	1.5	2.5	3.5	8.0	13.0	17.5	18.5	18.0
13	13.0	8.5	4.5	2.5	1.5	2.5	3.5	7.5	13.0	18.5	18.5	18.0
14	13.0	9.0	4.5	2.5	1.5	2.5	4.0	7.5	13.0	18.5	18.5	16.5
15	12.0	9.0	5.0	2.0	2.0	2.5	4.0	7.5	13.0	18.5	20.0	16.0
16	12.0	9.0	5.5	2.5	2.5	2.5	4.0	8.5	11.5	18.5	20.0	16.0
17	12.0	9.0	5.5	2.5	2.5	2.5	4.0	9.0	12.0	19.5	20.0	16.0
18	12.5	8.5	5.5	2.0	2.0	2.5	4.5	9.0	12.0	20.0	20.0	16.0
19	13.0	9.0	5.0	2.0	1.5	3.0	4.5	10.0	12.0	19.0	20.0	15.5
20	13.0	8.5	5.5	2.0	1.5	2.5	4.5	10.0	12.0	17.0	19.0	15.0
21	13.0	8.0	5.0	2.0	1.5	2.5	4.5	10.0	12.5	17.0	19.5	14.5
22	12.5	7.5	5.5	2.0	1.5	3.0	4.5	10.0	12.5	17.5	19.5	14.5
23	12.5	8.0	5.0	2.0	1.5	3.0	4.5	10.0	12.5	17.0	19.5	15.0
24	12.5	8.0	5.0	2.0	2.0	3.0	4.5	11.0	13.5	17.0	19.0	14.5
25	13.0	7.0	4.0	1.5	2.0	3.0	4.5	11.0	14.5	18.0	19.0	16.0
26	13.0	6.5	3.0	1.5	2.0	3.0	5.0	12.0	15.0	18.0	19.5	16.0
27	13.0	6.5	3.0	1.5	2.0	3.0	5.5	12.5	15.0	18.0	19.0	16.0
28	13.0	6.0	2.0	1.5	2.0	3.0	5.5	12.5	14.5	18.0	19.0	15.5
29	13.0	7.0	2.5	1.5	---	3.0	6.0	12.5	14.5	17.0	18.0	15.5
30	13.0	7.0	2.5	1.5	---	3.0	6.0	12.5	15.0	18.0	18.5	15.5
31	13.0	---	2.5	1.5	---	3.5	---	12.5	---	17.0	18.5	---

## STREAMS TRIBUTARY TO LAKE MICHIGAN

04046000 BLACK RIVER NEAR GARNET, MI

LOCATION.--Lat 46°07'05", long 85°21'55", in SE¼ sec.13, T.43 N., R.9 W., Mackinac County, Hydrologic Unit 04060107, on right bank 10 ft (3 m) upstream from highway bridge, 15 ft (5 m) downstream from Peters Creek entering from right, 3.5 mi (5.6 km) upstream from Lake Michigan, and 4 mi (6 km) southwest of Garnet.

DRAINAGE AREA.--28 mi<sup>2</sup> (73 km<sup>2</sup>), approximately.

## WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--September 1951 to September 1978 (discontinued as a continuous-record station; converted to a crest-stage partial-record station).

REVISED RECORDS.--WSP 1707: 1959.

GAGE.--Water-stage recorder. Datum of gage is 629.7 ft (191.93 m) National Geodetic Vertical Datum of 1929.

REMARKS.--Water-discharge records good.

AVERAGE DISCHARGE.--27 years, 29.4 ft<sup>3</sup>/s (0.833 m<sup>3</sup>/s), 14.26 in/yr (362 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 860 ft<sup>3</sup>/s (24.4 m<sup>3</sup>/s) May 7, 1960, gage height, 8.55 ft (2.606 m), from rating curve extended above 400 ft<sup>3</sup>/s (11.3 m<sup>3</sup>/s); minimum, 4.9 ft<sup>3</sup>/s (0.14 m<sup>3</sup>/s) Mar. 11, 1956, gage height, 2.10 ft (0.640 m).

EXTREMES FOR CURRENT YEAR.--Peak discharges above base of 120 ft<sup>3</sup>/s (3.40 m<sup>3</sup>/s) and maximum (\*):

Date	Time	Discharge (ft <sup>3</sup> /s) (m <sup>3</sup> /s)	Gage height (ft) (m)	Date	Time	Discharge (ft <sup>3</sup> /s) (m <sup>3</sup> /s)	Gage height (ft) (m)
Oct. 9	0500	138 3.91	4.08 1.244	May 14	1100	*239 6.77	*5.01 1.527
Nov. 3	2000	166 4.70	4.39 1.338	July 23	0100	144 4.08	4.16 1.268
Nov. 7	0600	132 3.74	4.07 1.240	Sept. 14	1900	152 4.30	4.29 1.308
Apr. 21	2100	152 4.30	4.24 1.292				

Minimum discharge, 12 ft<sup>3</sup>/s (0.34 m<sup>3</sup>/s) July 17, 18, gage height, 2.42 ft (0.738 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	41	42	36	26	18	15	18	81	29	16	30	30
2	37	69	38	25	18	15	18	70	28	15	26	29
3	35	114	34	24	18	14	19	62	25	15	24	33
4	33	140	31	24	18	14	21	57	25	14	23	26
5	35	101	29	24	18	14	26	52	26	14	21	24
6	32	84	27	23	18	14	32	47	24	14	20	24
7	27	122	27	23	18	14	38	43	24	14	18	24
8	65	94	29	23	18	14	40	58	24	13	17	23
9	126	81	25	23	18	14	42	79	24	13	17	22
10	94	108	25	24	18	14	43	74	23	14	16	21
11	91	106	24	24	17	14	56	62	24	13	15	50
12	103	86	24	22	17	14	58	149	54	13	15	42
13	85	70	24	22	16	14	56	178	40	14	14	32
14	71	64	25	21	16	14	55	231	34	13	13	90
15	61	62	24	21	16	14	58	182	29	13	13	113
16	52	57	25	21	16	14	68	131	28	13	15	78
17	45	52	32	21	16	14	77	98	26	12	14	60
18	41	48	47	21	16	14	94	77	26	13	13	55
19	39	45	45	20	16	14	120	63	24	15	17	53
20	36	67	56	20	15	14	141	55	23	75	16	53
21	33	87	52	20	16	13	140	48	24	65	14	48
22	31	65	47	20	16	13	138	42	22	70	14	41
23	29	55	42	19	15	13	139	38	21	124	22	36
24	29	50	37	18	15	13	138	34	20	78	31	34
25	27	45	35	18	15	14	141	31	19	57	26	31
26	27	41	34	18	15	14	140	29	19	46	23	29
27	27	39	32	18	15	13	131	28	18	40	39	45
28	27	36	30	19	15	14	124	26	18	34	90	36
29	26	33	29	19	---	14	115	24	17	38	60	35
30	26	33	28	19	---	15	97	34	16	30	44	43
31	28	---	27	18	---	16	---	31	---	28	35	---
TOTAL	1459	2096	1020	658	463	434	2383	2214	754	946	755	1260
MEAN	47.1	69.9	32.9	21.2	16.5	14.0	79.4	71.4	25.1	30.5	24.4	42.0
MAX	126	140	56	26	18	16	141	231	54	124	90	113
MIN	26	33	24	18	15	13	18	24	16	12	13	21
CFSM	1.68	2.50	1.18	.76	.59	.50	2.84	2.55	.90	1.09	.87	1.50
IN.	1.94	2.78	1.36	.87	.62	.58	3.17	2.94	1.00	1.26	1.00	1.67

CAL YR 1977	TOTAL	13360.6	MEAN	36.6	MAX	186	MIN	7.0	CFSM	1.31	IN	17.75
WTR YR 1978	TOTAL	14442.0	MEAN	39.6	MAX	231	MIN	12	CFSM	1.41	IN	19.19

STREAMS TRIBUTARY TO LAKE MICHIGAN  
04046000 BLACK RIVER NEAR GARNET, MI--CONTINUED

63

WATER-QUALITY RECORDS

PERIOD OF DAILY RECORD.--

WATER TEMPERATURES: October 1951 to September 1975, October 1976 to September 1978 (discontinued).

INSTRUMENTATION.--Temperature recorder since Oct. 1, 1951.

REMARKS.--Temperature recorder clock stopped Nov. 25 to Dec. 14 (range in temperature 1.0 to 2.0°C), Dec. 31 to Jan. 9 (range in temperature 0.5 to 1.0°C). Intermittent ice cover during winter period.

EXTREMES FOR PERIOD OF DAILY RECORD.--

WATER TEMPERATURES (Water years 1952-75, 1977-78): Maximum, 19.5°C July 21, 22, 1952; minimum, 0.0°C on many days during winter periods.

EXTREMES FOR CURRENT YEAR.--

WATER TEMPERATURES: Maximum, 17.0°C July 20-22, 24, 26, 27, Aug. 6, 7, 14, 29, Sept. 2; minimum, 0.0°C on several days during January and February.

CORRECTIONS.--Minimum water temperature for Apr. 20, 1977, 7.5°C. This figure supercedes that published in the report for 1977.

TEMPERATURE (DEG. C) OF WATER, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DAY	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN
	OCTOBER		NOVEMBER		DECEMBER		JANUARY		FEBRUARY		MARCH	
1	10.5	9.5	8.5	7.5	---	---	---	---	.0	.0	1.0	.5
2	9.0	8.0	8.5	8.5	---	---	---	---	.0	.0	.5	.5
3	8.5	7.5	9.0	8.5	---	---	---	---	.0	.0	1.5	.5
4	8.5	7.0	9.0	7.0	---	---	---	---	.0	.0	.5	.5
5	9.5	8.5	7.0	5.5	---	---	---	---	.0	.0	1.0	.5
6	9.0	7.5	6.0	5.5	---	---	---	---	.0	.0	1.0	.5
7	7.5	6.0	7.0	6.0	---	---	---	---	.0	.0	1.0	.5
8	7.0	6.5	8.0	7.0	---	---	---	---	.0	.0	2.0	1.0
9	7.5	7.0	8.5	8.0	---	---	---	---	.0	.0	2.5	1.5
10	7.0	6.0	8.5	7.0	---	---	.5	.5	.5	.0	3.0	2.5
11	7.5	7.0	7.0	4.0	---	---	.5	.5	1.0	.5	4.0	3.0
12	7.0	6.5	4.0	2.5	---	---	1.0	.5	1.0	1.0	3.5	2.0
13	6.5	6.0	2.5	2.0	---	---	1.0	.5	1.0	.5	3.0	3.0
14	7.5	6.0	2.5	2.0	---	---	.5	.5	.0	.0	3.5	2.5
15	7.5	7.5	4.0	2.5	2.0	2.0	.5	.5	1.0	.5	3.5	2.0
16	7.5	5.5	4.5	4.0	2.0	2.0	.5	.5	.0	.0	2.5	2.0
17	5.5	4.5	4.5	3.5	2.0	2.0	.5	.5	.5	.0	2.0	1.0
18	6.5	5.5	3.5	3.5	2.0	1.0	.5	.5	.5	.0	1.5	.5
19	7.0	6.0	3.5	3.0	1.5	1.0	.5	.5	.0	.0	3.0	1.0
20	6.5	5.5	3.5	3.0	1.5	1.5	.5	.5	.5	.0	2.0	1.0
21	7.0	6.5	3.5	2.0	1.5	1.5	.5	.5	.0	.0	3.0	2.0
22	7.0	6.0	2.0	1.5	1.5	1.0	.5	.5	1.0	.5	3.5	2.5
23	6.0	5.0	1.5	1.5	1.0	1.0	1.0	.5	1.0	.5	4.0	2.5
24	6.5	5.5	1.5	1.0	1.0	.5	1.0	1.0	1.5	1.0	2.5	1.0
25	7.5	6.5	---	---	.5	.5	1.5	1.0	1.5	1.5	2.5	1.0
26	8.5	7.5	---	---	.5	.5	1.5	.5	1.5	1.0	4.0	1.5
27	8.0	8.0	---	---	.5	.5	.5	.5	1.5	1.0	4.0	2.0
28	8.0	6.5	---	---	.5	.5	.5	.5	1.5	.5	4.5	3.0
29	6.5	6.0	---	---	.5	.5	.0	.0	---	---	4.5	2.5
30	6.5	6.0	---	---	.5	.5	.5	.0	---	---	3.5	2.5
31	7.5	6.5	---	---	---	---	.5	.0	---	---	3.5	3.0
MONTH	10.5	4.5							1.5	.0	4.5	.5

STREAMS TRIBUTARY TO LAKE MICHIGAN  
04046000 BLACK RIVER NEAR GARNET, MI--CONTINUED

TEMPERATURE (DEG. C) OF WATER, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DAY	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN
	APRIL		MAY		JUNE		JULY		AUGUST		SEPTEMBER	
1	3.5	2.5	6.5	5.0	14.5	12.5	15.0	13.0	15.5	13.5	15.5	13.0
2	3.0	1.0	7.5	5.5	13.0	11.5	16.0	12.5	15.5	14.0	17.0	15.5
3	2.5	2.0	8.5	6.0	12.5	9.5	16.0	12.5	15.5	13.5	16.5	15.0
4	3.0	2.0	9.0	6.5	12.0	10.5	15.5	11.5	15.0	12.5	16.0	13.5
5	4.0	2.0	9.5	7.0	12.0	10.0	15.0	12.0	16.5	14.0	15.0	14.0
6	3.0	2.0	9.5	8.0	13.5	10.0	15.0	13.5	17.0	14.5	16.0	15.0
7	2.5	2.0	10.5	7.0	12.5	11.5	14.0	13.0	17.0	14.0	16.0	15.0
8	2.5	1.0	10.0	8.5	13.0	10.0	16.0	13.0	16.5	14.5	14.5	14.0
9	2.0	1.5	8.5	7.5	13.0	11.0	14.0	12.0	15.5	13.5	14.5	13.5
10	1.5	1.5	9.5	7.0	12.0	10.5	14.0	11.5	15.5	12.5	15.5	13.5
11	1.5	1.5	10.0	8.5	13.0	11.0	14.5	10.5	15.0	12.0	16.0	15.0
12	1.5	1.5	10.0	10.0	12.0	11.5	14.5	11.0	15.5	12.5	16.0	13.5
13	2.0	1.5	10.0	8.0	12.5	10.0	16.0	13.0	16.5	13.5	13.0	12.0
14	2.5	1.5	8.5	7.5	12.5	10.0	15.5	12.5	17.0	13.5	13.0	12.0
15	2.5	1.5	13.0	8.5	12.0	11.0	15.5	13.5	16.5	14.0	13.0	13.0
16	3.0	1.0	14.0	12.5	12.5	12.0	15.0	11.5	16.0	15.0	13.0	12.5
17	3.0	1.5	15.5	12.5	14.0	12.0	15.0	11.5	15.5	14.0	13.0	12.5
18	2.5	1.5	16.5	14.0	15.0	13.0	14.0	13.0	15.0	13.0	13.0	12.0
19	2.5	1.5	15.5	13.5	15.0	12.0	15.0	13.0	15.0	14.0	12.0	12.0
20	2.0	1.5	15.0	11.5	14.5	12.0	17.0	15.0	14.5	12.0	13.0	12.0
21	3.0	1.5	12.0	9.5	14.0	12.5	17.0	16.0	15.5	12.5	12.5	12.0
22	4.0	1.5	13.0	9.5	14.5	11.0	17.0	16.0	15.0	13.5	12.0	10.5
23	4.0	2.0	13.5	10.5	13.0	11.0	16.5	15.5	14.5	13.0	12.0	10.5
24	5.5	3.0	14.0	10.5	14.0	10.5	17.0	16.0	15.0	14.5	12.5	9.0
25	6.5	3.5	14.5	10.5	14.5	12.5	16.0	15.5	15.0	14.5	12.0	10.5
26	6.5	4.5	16.0	12.0	14.5	13.5	17.0	15.5	16.0	14.5	11.5	10.0
27	7.5	5.0	16.0	13.5	14.5	13.5	17.0	15.0	16.0	15.0	11.5	10.5
28	8.0	6.0	16.5	13.5	15.0	12.0	15.0	13.5	16.5	16.0	10.5	9.5
29	8.5	7.5	16.5	13.5	16.5	12.5	15.5	14.5	17.0	16.0	10.0	10.0
30	8.0	5.5	16.0	14.0	14.5	12.5	15.0	13.0	16.5	15.5	10.5	10.0
31	---	---	15.5	13.5	---	---	14.5	13.0	15.0	13.0	---	---
MONTH	8.5	1.0	16.5	5.0	16.5	9.5	17.0	10.5	17.0	12.0	17.0	9.0

## STREAMS TRIBUTARY TO LAKE MICHIGAN

65

## 04056500 MANISTIQUE RIVER NEAR MANISTIQUE, MI

LOCATION.--Lat 46°01'50", long 86°09'40", in SE¼ sec.15, T.42 N., R.15 W., Schoolcraft County, Hydrologic Unit 04060106, on left bank 1.0 mi (1.6 km) downstream from West Branch, 6.0 mi (9.7 km) northeast of Manistique, and at mile 19.5 (31.4 km).

DRAINAGE AREA.--1,100 mi<sup>2</sup> (2,849 km<sup>2</sup>), approximately.

PERIOD OF RECORD.--March 1938 to current year.

REVISED RECORDS.--WSP 1387: 1940-42(M), 1943, 1945. WSP 1627, 1727: 1938, 1939.

GAGE.--Water-stage recorder. Altitude of gage is 608 ft (185.3 m) from river-profile map (nearest ft). Prior to July 15, 1939, non-recording gage at site 1,600 ft (487.7 m) upstream at different datum.

REMARKS.--Records good except those for the winter period, which are fair. Since July 1948, slight regulation by dam on outlet of Manistique Lake. Several observations of water temperature were made during the year.

AVERAGE DISCHARGE.--40 years, 1,427 ft<sup>3</sup>/s (40.41 m<sup>3</sup>/s), 17.62 in/yr (448 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 16,900 ft<sup>3</sup>/s (479 m<sup>3</sup>/s) May 11, 1960, gage height, 12.85 ft (3.917 m); minimum, 288 ft<sup>3</sup>/s (8.16 m<sup>3</sup>/s) Oct. 4, 1948; minimum gage height, 1.01 ft (0.308 m) Aug. 23, 1941.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 7,100 ft<sup>3</sup>/s (201 m<sup>3</sup>/s) May 17, gage height, 10.70 ft (3.261 m); minimum, 634 ft<sup>3</sup>/s (18.0 m<sup>3</sup>/s) Aug. 15, gage height, 2.84 ft (0.866 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1660	1160	2400	1900	1000	970	1250	5140	1700	1080	1150	2710
2	1610	1370	2500	1900	1000	970	1300	4930	1640	1040	1110	2670
3	1540	1790	2450	1850	1000	960	1400	4580	1580	1010	1130	2510
4	1460	2490	2400	1800	1000	960	1500	4190	1540	975	1130	2410
5	1390	3060	2250	1750	980	960	1710	3830	1530	940	1080	2460
6	1320	3380	2150	1700	980	960	1830	3500	1500	914	1000	2450
7	1290	3830	2000	1650	980	960	2060	3230	1460	908	926	2350
8	1300	4300	1900	1650	960	960	2340	3090	1430	920	864	2210
9	1530	4690	1800	1600	950	960	2700	3080	1450	908	817	2090
10	1790	5000	1800	1600	950	950	3000	3140	1430	917	770	1980
11	1900	5120	1800	1550	940	940	3230	3220	1390	907	733	1970
12	2030	4990	1800	1500	940	940	3410	3300	1440	884	704	2370
13	2100	4760	1800	1450	930	940	3540	3510	1660	865	681	2740
14	2110	4450	1800	1450	930	940	3620	3990	1830	839	660	2950
15	2080	4160	1850	1400	920	940	3660	4750	1910	820	642	3330
16	2000	3930	1900	1400	920	940	3660	6100	1960	807	690	3710
17	1890	3730	2000	1350	920	950	3720	7060	1950	796	969	3880
18	1790	3540	2100	1350	920	960	3900	6620	1870	785	1360	3800
19	1690	3350	2200	1300	920	950	4170	5840	1760	781	1760	3560
20	1600	3240	2250	1250	920	940	4600	5150	1710	854	2080	3320
21	1540	3300	2300	1250	930	920	5130	4510	1670	979	2160	3110
22	1470	3430	2300	1200	940	920	5570	3980	1580	1030	1990	2900
23	1400	3380	2300	1150	950	920	5670	3500	1470	1170	1900	2660
24	1350	3350	2250	1150	950	920	5580	3070	1370	1340	2070	2450
25	1310	3140	2200	1150	960	930	5520	2760	1320	1360	2250	2260
26	1280	2940	2150	1100	970	950	5480	2500	1270	1320	2260	2110
27	1250	2740	2100	1050	970	970	5480	2280	1220	1300	2220	2070
28	1220	2610	2050	1050	970	1000	5470	2120	1180	1230	2380	2130
29	1190	2500	2000	1000	---	1050	5420	2000	1190	1180	2690	2220
30	1160	2300	2000	1000	---	1100	5290	1890	1140	1220	2810	2320
31	1140	---	1950	1000	---	1200	---	1790	---	1190	2780	---
TOTAL	48390	102030	64750	43500	26700	29930	111210	118650	46150	31269	45766	79700
MEAN	1561	3401	2089	1403	954	965	3707	3827	1538	1009	1476	2657
MAX	2110	5120	2500	1900	1000	1200	5670	7060	1960	1360	2810	3880
MIN	1140	1160	1800	1000	920	920	1250	1790	1140	781	642	1970
CFSM	1.42	3.09	1.90	1.28	.87	.88	3.37	3.48	1.40	.92	1.34	2.42
IN.	1.64	3.45	2.19	1.47	.90	1.01	3.76	4.01	1.56	1.06	1.55	2.70
CAL YR 1977 TOTAL	639617			1752	7540	460	CFSM 1.59	IN 21.63				
WTR YR 1978 TOTAL	748045			2049	7060	642	CFSM 1.86	IN 25.30				



04057004 MANISTIQUE RIVER ABOVE MANISTIQUE, MI  
(National stream-quality accounting network station)

LOCATION.--Lat 45°58'18", long 86°14'35", in SE¼ SE¼ sec.1, T.41 N., R.16 W., Schoolcraft County, Hydrologic Unit 04060106, at Wyman State Nursery, 0.7 mi (1.1 km) downstream from Indian River, 0.8 mi (1.3 km) upstream from U.S. Highway 2 and 1.8 mi (2.9 km) upstream from mouth.

DRAINAGE AREA.--1,445 mi<sup>2</sup> (3,743 km<sup>2</sup>), approximately.

PERIOD OF RECORD.--Water year 1976 to current year.

PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE: October 1975 to current year.

WATER TEMPERATURES: October 1975 to current year.

INSTRUMENTATION.--Water-quality monitor since October 1975.

REMARKS.--Monthly samples are collected as a cross-section sample at the Wyman State Nursery site or at railroad bridge 1,200 ft (366 m) downstream. Intermittent ice cover during winter period. Prior to Oct. 1, 1975, water-quality data collected at station 04057005 Manistique River at Manistique, MI, 1.5 mi (2.4 km) downstream.

EXTREMES FOR PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE: Maximum, 254 micromhos Nov. 24, 1977; minimum daily (water year 1976), 77 micromhos Apr. 12, 1976.

WATER TEMPERATURES: Maximum, 25.5°C July 20, 21, 1977; minimum, 0.0°C on many days during winter periods.

EXTREMES FOR CURRENT YEAR.--

SPECIFIC CONDUCTANCE: Maximum recorded, 227 micromhos May 30; minimum recorded, 97 micromhos May 6.

WATER TEMPERATURES: Maximum, 25.0°C Aug. 14, 15; minimum, 0.0°C on many days during winter period.

WATER QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DATE	TIME	STREAM- FLOW, INSTAN- TANEOUS (CFS)	SPF- CIFIC CON- DUCT- ANCE (MICRO- MHOS)	PH (UNITS)	TEMPER- ATURE (DEG C)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED SATUR- ATION	COLI- FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML)	STREP- TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML)	HARD- NESS (MG/L AS CaCO3)	HARD- NESS, NONCAR- BONATE (MG/L CaCO3)
OCT											
05...	1030	1740	174	7.3	12.0	9.5	90	23	K6	88	26
NOV											
02...	1015	1600	211	7.6	9.0	10.7	93	K7	38	99	30
DEC											
07...	1530	2620	167	6.9	.0	12.4	86	K2	K4	76	24
JAN											
04...	1430	2680	165	7.2	.0	9.2	64	<1	K4	77	28
FEB											
08...	1245	1210	185	7.0	.0	9.4	66	--	<1	94	25
MAR											
08...	0900	E1300	190	7.0	.5	10.4	74	K1	<1	90	11
APR											
12...	1030	4040	124	7.0	1.0	12.0	86	K2	K11	53	10
MAY											
09...	1030	3260	126	7.9	11.0	9.8	91	K4	28	63	20
JUN											
27...	1130	E1700	175	7.9	20.0	8.0	89	--	--	88	30
AUG											
01...	1030	1720	162	7.6	18.0	8.3	89	K3	200	84	19
31...	1200	1660	138	7.6	17.5	7.6	81	K33	--	68	16
SEP											
20...	1130	4700	155	7.3	14.0	8.1	79	K10	K64	68	16

DATE	CALCIUM DIS- SOLVED (MG/L AS CA)	MAGNE- SIUM, DIS- SOLVED (MG/L AS MG)	SODIUM, DIS- SOLVED (MG/L AS NA)	SODIUM AD- SORP- TION RATIO	SODIUM PERCENT	POTAS- SIUM, DIS- SOLVED (MG/L AS K)	BICAR- BONATE (MG/L AS HCO3)	CAR- BONATE (MG/L AS CO3)	ALKA- LINITY (MG/L AS CaCO3)	CARBON DIOXIDE DIS- SOLVED (MG/L AS CO2)	SULFATE DIS- SOLVED (MG/L AS SO4)
OCT											
05...	26	5.7	1.2	.1	3	.8	76	0	62	6.1	27
NOV											
02...	30	5.9	1.2	.1	3	.8	84	0	69	3.4	30
DEC											
07...	23	4.6	1.0	.1	3	.6	64	0	53	13	21
JAN											
04...	23	4.8	1.3	.1	4	.6	60	0	49	6.1	21
FEB											
08...	28	5.9	1.5	.1	3	.8	84	0	69	13	25
MAR											
08...	26	6.0	1.3	.1	3	.7	96	0	79	15	21
APR											
12...	15	3.7	1.0	.1	4	.6	52	0	43	8.3	13
MAY											
09...	19	3.8	1.1	.1	4	.7	52	0	43	1.0	18
JUN											
27...	26	5.5	1.2	.1	3	.6	83	0	58	1.7	16
AUG											
01...	25	5.3	1.3	.1	3	.6	79	0	65	3.2	20
31...	20	4.5	1.0	.1	3	.8	64	0	52	2.6	12
SEP											
20...	20	4.5	1.3	.1	4	.6	64	0	52	5.1	14

K--RESULTS BASED ON COLONY COUNT OUTSIDE THE ACCEPTABLE RANGE (NON-IDEAL COLONY COUNT)

E--ESTIMATED VALUE

## 04057004 MANISTIQUE RIVER ABOVE MANISTIQUE, MI--CONTINUED

## WATER-QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978--CONTINUED

DATE	CHLORIDE, DIS- SOLVED (MG/L AS CL)	FLUORIDE, DIS- SOLVED (MG/L AS F)	SILICA, DIS- SOLVED (MG/L AS SiO2)	SOLIDS, RESIDUE AT 180 DEG. C DIS- SOLVED (MG/L)	SOLIDS, SUM OF CONSTITUENTS, DIS- SOLVED (MG/L)	SOLIDS, DIS- SOLVED (TONS PER DAY)	NITRO- GEN, NO2+NO3 TOTAL (MG/L AS N)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N)	NITRO- GEN, ORGANIC TOTAL (MG/L AS N)	NITRO- GEN+AM- MONIA + ORGANIC TOTAL (MG/L AS N)
OCT 05...	2.0	.0	6.4	133	107	625	.04	.01	--	--
NOV 02...	2.1	.0	6.1	137	117	592	.08	.05	--	--
DEC 07...	2.2	.0	5.9	111	90	785	.10	.05	--	--
JAN 04...	1.5	.0	6.3	97	88	702	.13	.03	--	--
FEB 08...	1.6	.0	7.2	123	111	402	.15	.04	.39	.43
MAR 08...	.5	.1	7.9	132	111	--	.17	.00	--	--
APR 12...	2.6	.0	5.8	86	68	938	.22	.03	.32	.35
MAY 09...	.4	.0	3.7	93	72	819	.06	.01	.45	.46
JUN 27...	.4	.1	4.6	144	130	--	.07	.03	.42	.45
AUG 01...	1.6	.0	6.1	125	100	580	.08	.05	--	--
31...	2.6	.0	6.0	123	78	551	.07	.03	.80	.83
SEP 20...	2.0	.0	.6	112	75	1420	.05	.03	.76	.79

DATE	NITRO- GEN+NH4 + ORG. SUSP. TOTAL (MG/L AS N)	NITRO- GEN+AM- MONIA + ORGANIC DIS. (MG/L AS N)	NITRO- GEN, TOTAL (MG/L AS N)	NITRO- GEN, TOTAL (MG/L AS NO3)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, DIS- SOLVED (MG/L AS P)	CARBON, ORGANIC TOTAL (MG/L AS C)	SEDI- MENT, SUS- PENDED (MG/L)	SEDI- MENT DIS- CHARGE, SUS- PENDED (T/DAY)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM
OCT 05...	--	.58	--	--	.01	.01	--	5	23	100
NOV 02...	--	.93	--	--	.01	.01	8.4	6	26	100
DEC 07...	--	.50	--	--	.01	.01	10	2	14	100
JAN 04...	--	.27	--	--	.01	.01	--	2	14	100
FEB 08...	.05	.38	.58	2.6	.01	.02	8.4	3	9.8	100
MAR 08...	--	.33	--	--	.01	.01	8.6	--	--	--
APR 12...	.00	.37	.57	2.5	.01	.00	--	6	65	100
MAY 09...	.05	.41	.52	2.3	.02	.00	5.2	5	44	100
JUN 27...	.15	.30	.52	2.3	.01	.00	9.5	4	--	100
AUG 01...	.00	.49	--	--	.02	.00	--	4	19	100
31...	.00	--	.90	4.0	.02	.02	16	9	40	100
SEP 20...	.00	--	.84	3.7	.02	.01	19	6	76	100

DATE	TIME	ARSENIC TOTAL (UG/L AS AS)	ARSENIC DIS- SOLVED (UG/L AS AS)	BARIUM, TOTAL RECOV- ERABLE (UG/L AS BA)	BARIUM, DIS- SOLVED (UG/L AS BA)	CADMIUM TOTAL RECOV- ERABLE (UG/L AS CD)	CADMIUM DIS- SOLVED (UG/L AS CD)	CHRO- MIUM, TOTAL RECOV- ERABLE (UG/L AS CR)	CHRO- MIUM, DIS- SOLVED (UG/L AS CR)	COBALT, TOTAL RECOV- ERABLE (UG/L AS CO)
OCT 05...	1030	0	2	0	0	0	0	10	0	0
JAN 04...	1430	2	2	0	0	--	1	20	0	0
MAR 08...	0900	--	--	--	--	--	--	--	--	--
APR 12...	1030	1	0	0	0	1	0	10	1	0
AUG 01...	1030	1	1	0	0	0	0	<10	4	0

## STREAMS TRIBUTARY TO LAKE MICHIGAN

04057004 MANISTIQUE RIVER ABOVE MANISTIQUE, MI--CONTINUED

WATER-QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978--CONTINUED

DATE	CORALTY, DIS- SOLVED (UG/L AS CO)	COPPER, TOTAL RECOV- ERABLE (UG/L AS CU)	COPPER, DIS- SOLVED (UG/L AS CU)	IRON, TOTAL RECOV- ERABLE (UG/L AS FE)	IRON, DIS- SOLVED (UG/L AS FE)	LEAD, TOTAL RECOV- ERABLE (UG/L AS PR)	LEAD, DIS- SOLVED (UG/L AS PB)	MANGA- NESE, TOTAL RECOV- ERABLE (UG/L AS MN)	MANGA- NESE, DIS- SOLVED (UG/L AS MN)	MERCURY TOTAL RECOV- ERABLE (UG/L AS HG)
OCT 05...	0	4	2	820	660	14	6	30	20	<.5
JAN 04...	0	9	1	720	360	13	6	10	10	<.5
MAR 08...	--	--	--	--	530	--	--	--	--	--
APR 12...	0	8	4	1300	650	8	9	50	40	<.5
AUG 01...	0	4	4	1100	610	4	4	40	10	<.5

DATE	MERCURY DIS- SOLVED (UG/L AS HG)	SELE- NIUM, TOTAL (UG/L AS SE)	SELE- NIUM, DIS- SOLVED (UG/L AS SE)	SILVER, TOTAL RECOV- ERABLE (UG/L AS AG)	SILVER, DIS- SOLVED (UG/L AS AG)	ZINC, TOTAL RECOV- ERABLE (UG/L AS ZN)	ZINC, DIS- SOLVED (UG/L AS ZN)	CARBON, ORGANIC DIS- SOLVED (MG/L AS C)	CARBON, ORGANIC SUS- PENDED TOTAL (MG/L AS C)
OCT 05...	<.5	0	0	0	0	10	0	7.5	--
JAN 04...	<.5	0	0	0	0	20	20	--	.2
MAR 08...	--	--	--	--	--	--	--	--	--
APR 12...	<.5	0	0	1	0	20	20	8.9	--
AUG 01...	<.5	0	0	0	0	10	10	10	--

QUALITATIVE AND ASSOCIATED QUANTITATIVE ANALYSES OF BIOLOGICAL DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
PERIPHYTON

DATE	TIME	LENGTH OF EXPO- SURE (DAYS)	PERI- PHYTON BIOMASS ASH WEIGHT G/SQ M	PERI- PHYTON BIOMASS TOTAL DRY WEIGHT G/SQ M	CHLOR-A PERI- PHYTON CHROMO- GRAPHIC FLUOROM (MG/M2)	CHLOR-B PERI- PHYTON CHROMO- GRAPHIC FLUOROM (MG/M2)
NOV 02...	1015	28	.079	.079	.009	.001
FEH 08...	1245	35	.000	.079	.160	.000
MAY 09...	1030	27	3.62	5.35	.500	.080
SEP 20...	1130	20	.000	.000	.030	.000

## 04057004 MANISTIQUE RIVER ABOVE MANISTIQUE, MI--CONTINUED

SPECIFIC CONDUCTANCE (MICROMHOS/CM AT 25 DEG. C), WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
OCTOBER			NOVEMBER			DECEMBER			JANUARY			
1	181	173	177	205	197	202	168	167	167	169	165	168
2	186	177	181	212	200	205	167	157	162	166	163	164
3	194	181	187	205	193	201	168	156	160	168	164	166
4	192	173	182	191	163	177	165	156	160	168	164	166
5	195	187	191	163	153	156	166	163	164	166	164	165
6	189	160	180	163	151	156	169	164	166	170	164	167
7	181	155	168	162	155	158	170	165	167	175	171	174
8	189	178	184	158	147	152	171	162	168	175	169	173
9	190	177	185	149	144	147	176	171	173	172	168	170
10	181	163	174	146	135	138	173	171	172	175	171	174
11	178	164	172	136	122	129	174	169	171	175	173	174
12	168	157	163	124	116	121	182	175	179	177	174	176
13	156	136	147	127	119	124	184	179	182	177	175	176
14	168	154	160	130	125	128	185	184	185	177	175	176
15	165	154	160	139	130	135	185	183	185	179	175	177
16	159	148	153	140	134	137	184	182	183	179	176	177
17	162	148	153	145	131	137	181	179	180	177	175	176
18	174	163	168	144	129	139	180	178	179	178	175	176
19	175	159	167	---	---	---	178	173	176	181	177	179
20	177	147	159	148	133	140	173	171	172	180	177	179
21	194	177	187	138	130	134	171	162	166	183	178	180
22	184	168	176	133	123	128	162	153	157	182	178	180
23	181	161	172	142	134	138	157	151	154	185	180	183
24	198	180	188	139	129	135	156	150	153	185	181	183
25	204	190	197	---	---	---	158	153	155	184	180	182
26	200	193	196	140	129	136	162	152	158	185	182	184
27	196	187	191	149	137	141	163	159	161	189	185	188
28	196	181	189	159	152	155	167	161	163	189	187	188
29	193	181	188	160	153	157	167	161	163	188	186	187
30	196	188	192	166	160	164	170	162	166	188	184	187
31	197	190	194	---	---	---	170	163	166	184	180	182
MONTH	204	136	177				185	150	168	189	163	177

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
FEBRUARY			MARCH			APRIL			MAY			
1	187	182	185	192	189	190	149	137	142	---	---	---
2	188	186	187	192	185	189	145	137	140	---	---	---
3	188	185	187	192	190	191	139	134	136	---	---	---
4	188	185	187	194	190	192	139	131	134	---	---	---
5	187	185	186	193	188	191	---	---	---	---	---	---
6	186	185	185	195	188	192	---	---	---	127	97	113
7	186	183	185	194	190	192	---	---	---	127	103	116
8	185	183	184	196	188	193	---	---	---	124	116	121
9	186	181	183	198	193	196	---	---	---	127	119	125
10	187	182	185	199	194	197	---	---	---	128	124	126
11	187	184	186	199	196	198	---	---	---	131	127	128
12	188	185	187	197	189	192	---	---	---	132	129	131
13	188	185	187	188	186	187	---	---	---	129	128	129
14	189	185	187	187	182	185	---	---	---	130	127	129
15	188	186	187	190	180	184	---	---	---	142	130	136
16	186	184	185	180	172	176	---	---	---	139	132	135
17	187	184	186	176	164	170	---	---	---	137	117	130
18	187	185	186	168	160	164	---	---	---	123	102	108
19	187	181	185	184	166	175	---	---	---	107	97	103
20	188	185	187	182	168	175	---	---	---	117	105	110
21	189	185	187	179	169	175	---	---	---	128	107	119
22	190	183	186	180	170	174	---	---	---	136	119	129
23	192	187	189	178	158	168	---	---	---	155	133	142
24	192	190	191	174	156	165	---	---	---	167	146	156
25	192	190	191	168	149	156	---	---	---	173	160	167
26	192	190	191	166	150	155	---	---	---	182	171	176
27	192	190	191	165	151	157	---	---	---	189	180	185
28	191	189	190	170	154	161	---	---	---	197	184	190
29	---	---	---	168	153	159	---	---	---	216	197	209
30	---	---	---	153	146	150	---	---	---	227	213	221
31	---	---	---	146	140	143	---	---	---	---	---	---
MONTH	192	181	187	199	140	177						

STREAMS TRIBUTARY TO LAKE MICHIGAN  
04057004 MANISTIQUE RIVER ABOVE MANISTIQUE, MI--CONTINUED

SPECIFIC CONDUCTANCE (MICROMHOS/CM AT 25 DEG. C), WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
	JUNE			JULY			AUGUST			SEPTEMBER		
1	---	---	---	188	176	181	160	130	141	155	145	151
2	---	---	---	188	177	182	149	132	136	157	150	153
3	---	---	---	189	183	186	137	130	134	162	152	158
4	---	---	---	192	180	185	148	134	140	175	159	170
5	---	---	---	192	185	188	157	137	145	180	174	176
6	---	---	---	194	185	189	160	144	151	180	175	177
7	---	---	---	189	185	187	167	145	152	179	169	172
8	---	---	---	190	185	187	177	150	164	174	170	173
9	---	---	---	187	178	181	173	141	155	185	169	179
10	---	---	---	181	173	177	166	145	155	188	182	186
11	---	---	---	179	170	175	168	152	160	188	181	184
12	---	---	---	180	166	172	179	167	175	187	182	186
13	---	---	---	177	166	172	185	181	183	186	179	182
14	---	---	---	180	169	174	198	185	189	180	170	175
15	---	---	---	176	171	174	197	191	194	179	168	172
16	---	---	---	181	170	175	197	191	193	170	164	167
17	---	---	---	182	172	176	201	186	192	166	159	163
18	---	---	---	178	173	175	195	174	187	165	161	163
19	---	---	---	182	172	177	175	133	156	171	162	165
20	---	---	---	175	172	174	134	124	129	171	165	167
21	---	---	---	175	167	171	136	127	131	175	165	170
22	---	---	---	171	163	168	140	132	136	172	165	167
23	---	---	---	162	151	158	156	130	137	182	173	176
24	---	---	---	149	132	140	165	150	158	185	182	183
25	---	---	---	129	125	127	168	158	162	185	178	181
26	---	---	---	131	125	128	175	163	170	184	177	181
27	---	---	---	126	121	124	170	165	167	184	178	180
28	188	169	180	123	115	119	171	161	167	189	180	185
29	191	178	184	127	114	120	161	138	148	187	183	185
30	190	178	183	134	117	127	150	134	144	183	171	178
31	---	---	---	143	125	132	155	129	140	---	---	---
MONTH				194	114	165	201	124	158	189	145	174

TEMPERATURE (DEG. C) OF WATER, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
	OCTOBER			NOVEMBER			DECEMBER			JANUARY		
1	13.0	12.5	13.0	9.0	8.0	8.5	.0	.0	.0	.0	.0	.0
2	13.0	12.0	12.5	9.5	8.5	9.0	.0	.0	.0	.0	.0	.0
3	12.5	11.5	12.5	10.0	9.5	10.0	.0	.0	.0	.0	.0	.0
4	12.5	11.5	12.0	10.0	9.0	9.5	.0	.0	.0	.0	.0	.0
5	13.0	12.5	13.0	9.0	8.5	8.5	.0	.0	.0	.0	.0	.0
6	12.5	11.0	11.5	8.5	8.0	8.0	.0	.0	.0	.0	.0	.0
7	11.0	10.0	10.5	8.0	7.5	8.0	.0	.0	.0	.0	.0	.0
8	10.5	10.0	10.0	8.5	8.0	8.0	.0	.0	.0	.0	.0	.0
9	10.0	8.5	9.5	9.5	8.5	9.0	.0	.0	.0	.0	.0	.0
10	9.0	8.0	8.5	9.5	8.5	9.0	.0	.0	.0	.0	.0	.0
11	9.5	8.5	9.0	8.5	5.5	7.0	.0	.0	.0	.0	.0	.0
12	8.5	8.0	8.0	5.5	4.0	5.0	.0	.0	.0	.0	.0	.0
13	8.5	7.0	8.0	8.0	3.5	5.5	.0	.0	.0	.0	.0	.0
14	8.5	8.0	8.5	7.0	6.0	6.5	.0	.0	.0	.0	.0	.0
15	8.5	8.0	8.5	7.5	6.0	7.0	.0	.0	.0	.0	.0	.0
16	8.0	7.5	7.5	8.0	6.5	7.0	.0	.0	.0	.0	.0	.0
17	8.0	6.5	7.5	6.5	6.0	6.0	.5	.0	.0	.0	.0	.0
18	8.0	7.5	7.5	6.5	5.5	6.0	.0	.0	.0	.0	.0	.0
19	8.0	7.0	7.5	6.5	2.0	5.5	.5	.0	.0	.0	.0	.0
20	8.5	7.0	8.0	7.5	6.0	6.5	.5	.0	.5	.0	.0	.0
21	8.5	8.0	8.5	6.0	.0	3.5	.5	.0	.0	.0	.0	.0
22	8.0	7.5	8.0	4.0	.0	.5	.0	.0	.0	.0	.0	.0
23	7.5	6.5	7.5	5.5	5.0	5.0	.0	.0	.0	.0	.0	.0
24	8.5	7.0	7.5	5.0	.0	.5	.0	.0	.0	.0	.0	.0
25	8.5	8.0	8.5	.0	.0	.0	.0	.0	.0	.0	.0	.0
26	9.5	8.5	9.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
27	9.5	8.5	9.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
28	9.0	8.0	8.5	5.5	.0	.5	.0	.0	.0	.0	.0	.0
29	8.5	8.0	8.5	6.0	.0	2.5	.0	.0	.0	.0	.0	.0
30	8.0	8.0	8.0	5.5	.0	1.5	.0	.0	.0	.0	.0	.0
31	8.0	7.5	8.0	---	---	---	.0	.0	.0	.0	.0	.0
MONTH	13.0	6.5	9.0	10.0	.0	5.5	.5	.0	.0	.0	.0	.0



STREAMS TRIBUTARY TO LAKE MICHIGAN  
04057004 MANISTIQUE RIVER ABOVE MANISTIQUE, MI--CONTINUED

TEMPERATURE (DEG. C) OF WATER, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
	FEBRUARY			MARCH			APRIL			MAY		
1	.0	.0	.0	.0	.0	.0	1.0	.5	1.0	9.5	8.0	8.5
2	.0	.0	.0	.0	.0	.0	1.0	.0	.5	9.5	7.5	8.5
3	.0	.0	.0	.5	.0	.0	.5	.5	.5	9.5	8.0	9.0
4	.0	.0	.0	.0	.0	.0	1.0	.5	.5	10.0	8.5	9.5
5	.0	.0	.0	.0	.0	.0	1.5	.5	1.0	11.0	9.5	10.0
6	.0	.0	.0	.0	.0	.0	1.0	.5	1.0	12.0	9.5	11.0
7	.0	.0	.0	.5	.0	.5	3.5	1.0	2.5	13.0	11.0	12.0
8	.0	.0	.0	.5	.5	.5	4.0	2.5	3.5	12.5	11.5	11.5
9	.0	.0	.0	.5	.5	.5	3.5	2.5	3.0	11.5	10.5	11.0
10	.0	.0	.0	.5	.5	.5	2.5	1.5	2.0	12.0	10.0	11.0
11	.0	.0	.0	1.0	.5	.5	1.5	1.5	1.5	11.5	10.5	11.0
12	.0	.0	.0	1.0	.5	1.0	2.5	1.0	1.5	11.0	11.0	11.0
13	.0	.0	.0	1.0	.5	1.0	2.5	2.0	2.5	11.0	9.5	10.0
14	.0	.0	.0	1.0	.5	.5	2.5	2.0	2.5	9.5	9.5	9.5
15	.0	.0	.0	1.0	.5	.5	3.5	1.5	2.5	11.5	9.0	10.5
16	.0	.0	.0	1.0	.5	.5	4.5	2.5	3.5	14.0	11.5	12.5
17	.0	.0	.0	1.0	.5	.5	5.0	3.0	4.0	16.0	13.5	14.5
18	.0	.0	.0	.5	.5	.5	5.0	4.0	4.5	18.0	14.5	16.5
19	.0	.0	.0	1.0	.5	.5	5.0	4.5	4.5	19.0	17.0	18.0
20	.0	.0	.0	.5	.5	.5	4.5	3.5	4.0	18.5	17.0	18.0
21	.0	.0	.0	1.0	.5	.5	5.5	3.0	4.0	17.5	15.5	16.5
22	.0	.0	.0	1.5	.5	1.0	5.5	3.5	4.5	17.5	16.0	17.0
23	.0	.0	.0	1.5	.5	1.0	6.0	4.5	5.5	18.0	16.0	17.0
24	.0	.0	.0	1.0	.5	.5	8.0	5.5	6.5	18.5	16.5	17.5
25	.0	.0	.0	1.0	.5	1.0	8.5	7.0	8.0	19.0	17.5	18.5
26	.0	.0	.0	1.5	.5	1.0	9.0	7.5	8.5	19.5	18.0	18.5
27	.0	.0	.0	1.5	1.0	1.0	10.0	8.0	9.0	21.0	19.0	20.0
28	.0	.0	.0	1.5	1.0	1.0	10.5	9.0	10.0	21.5	20.0	20.5
29	---	---	---	1.5	.5	1.0	11.0	9.5	10.0	22.0	21.0	21.5
30	---	---	---	1.0	.5	1.0	10.0	8.5	9.5	22.0	21.0	21.5
31	---	---	---	1.0	1.0	1.0	---	---	---	---	---	---
MONTH	.0	.0	.0	1.5	.0	.5	11.0	.0	4.0			

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
	JUNE			JULY			AUGUST			SEPTEMBER		
1	---	---	---	23.5	23.0	23.0	20.0	18.5	19.0	19.5	18.0	19.0
2	---	---	---	23.5	22.5	23.0	20.5	19.0	19.5	20.0	18.5	19.0
3	---	---	---	24.0	22.5	23.5	20.0	19.0	19.5	20.0	18.5	19.5
4	---	---	---	24.5	23.0	23.5	20.0	18.5	19.5	19.5	18.5	19.0
5	---	---	---	24.0	23.5	23.5	21.0	19.0	20.0	19.0	18.5	19.0
6	---	---	---	24.0	23.0	23.5	22.0	20.0	21.0	20.0	18.5	19.0
7	---	---	---	23.5	23.0	23.0	23.0	21.5	22.0	20.0	18.5	19.0
8	---	---	---	23.0	22.0	22.5	23.0	22.0	22.5	18.5	18.0	18.5
9	---	---	---	23.0	22.5	22.5	23.0	22.0	22.5	18.5	18.0	19.0
10	---	---	---	22.0	21.0	21.5	23.0	21.5	22.0	19.5	18.0	18.5
11	---	---	---	22.0	21.0	21.5	23.0	21.5	22.0	19.5	19.0	19.5
12	---	---	---	22.0	21.0	21.5	23.0	22.0	22.5	19.0	17.5	18.0
13	---	---	---	22.5	20.5	21.5	24.0	22.5	23.0	17.0	16.0	16.5
14	---	---	---	23.0	21.5	22.0	25.0	23.5	24.0	16.0	15.0	15.5
15	---	---	---	23.0	22.0	22.5	25.0	24.0	24.5	16.0	14.5	15.0
16	---	---	---	23.0	22.0	22.5	24.5	24.0	24.0	15.5	14.5	15.0
17	---	---	---	23.5	22.0	22.5	24.0	23.0	23.5	15.5	14.5	15.0
18	---	---	---	23.0	21.5	22.0	23.5	22.5	23.0	15.0	14.5	14.5
19	---	---	---	23.0	21.0	22.0	22.5	21.5	22.0	14.5	14.0	14.5
20	---	---	---	23.0	22.0	22.5	21.5	20.5	21.0	14.5	14.5	14.5
21	---	---	---	23.0	22.0	22.5	21.0	20.0	20.5	15.0	14.5	14.5
22	---	---	---	22.5	21.5	22.5	21.0	20.0	20.5	15.0	14.0	14.5
23	---	---	---	22.0	20.5	21.0	20.5	19.5	20.0	15.0	14.0	14.5
24	---	---	---	22.5	20.5	21.0	19.5	19.0	19.0	15.5	14.5	15.0
25	---	---	---	22.0	21.0	21.5	19.0	18.5	18.5	15.0	14.5	14.5
26	---	---	---	22.0	21.0	21.5	19.0	18.5	18.5	15.0	14.0	14.5
27	---	---	---	21.5	20.5	21.0	18.5	18.0	18.5	15.0	14.5	14.5
28	23.5	22.0	22.5	20.5	19.0	20.0	18.5	18.0	18.5	14.5	13.5	14.0
29	24.5	23.0	23.5	20.0	19.0	19.5	19.5	18.0	18.5	14.5	13.5	14.0
30	24.5	23.5	24.0	20.0	18.5	19.5	19.5	18.0	19.0	13.5	13.5	13.5
31	---	---	---	20.0	18.5	19.0	19.0	17.5	18.0	---	---	---
MONTH				24.5	18.5	22.0	25.0	17.5	21.0	20.0	13.5	16.5

LOCATION.--Lat 45°56'35", long 86°42'20", in SW¼ SE¼ sec.17, T.41 N., R.19 W., Delta County, Hydrologic Unit 04030112, Hiawatha National Forest, on left bank 30 ft (9 m) upstream from bridge on Forest Service Road 2231, 500 ft (152 m) downstream from Mormon Creek, 0.1 mi (0.2 km) east of Federal Forest Highway 13, and 3.2 mi (5.1 km) north of Nahma Junction.

PERIOD OF RECORD.--October 1966 to current year.

REMARKS.--Records good except those for the winter period, which are fair. Several observations of water temperature were made during the year.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,580 ft<sup>3</sup>/s (44.7 m<sup>3</sup>/s) Apr. 18, 1971, Apr. 30, 1972, gage height, 9.85 ft (3.002 m); minimum, 35 ft<sup>3</sup>/s (0.991 m<sup>3</sup>/s) Sept. 11, 12, 13, 14, 1976, gage height, 3.58 ft (1.091 m).

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 1,060 ft<sup>3</sup>/s (30.0 m<sup>3</sup>/s) Nov. 4, gage height, 8.15 ft (2.484 m); minimum, 73 ft<sup>3</sup>/s (2.07 m<sup>3</sup>/s) July 18, gage height, 3.95 ft (1.204 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	283	185	260	205	140	105	150	658	216	103	181	407
2	253	290	270	200	140	100	170	580	204	100	212	352
3	229	588	270	195	140	100	200	518	193	96	211	310
4	205	1020	260	190	135	100	250	473	202	91	175	275
5	192	899	250	185	135	100	300	436	207	88	148	261
6	178	725	230	180	130	100	350	404	188	87	130	249
7	165	791	220	175	130	100	370	375	175	91	118	231
8	283	849	210	170	130	100	390	387	184	106	110	222
9	501	849	200	165	130	100	417	470	173	100	103	211
10	446	900	200	165	130	100	418	505	162	96	97	201
11	466	826	195	160	130	100	429	457	161	91	92	249
12	485	719	190	160	130	100	466	483	266	87	87	458
13	454	626	195	155	125	100	480	632	289	88	84	344
14	401	549	200	155	125	100	463	882	262	83	81	505
15	357	498	205	150	125	100	458	1020	241	80	78	713
16	320	478	215	145	120	100	492	975	216	77	205	509
17	288	450	225	145	120	100	544	871	202	75	453	511
18	262	414	230	145	120	100	609	722	212	78	464	477
19	241	391	240	145	120	100	775	586	190	84	438	454
20	221	401	250	140	115	100	883	502	172	142	450	413
21	205	500	250	140	115	100	820	431	165	160	371	374
22	191	450	250	140	115	100	815	373	152	165	285	331
23	178	412	250	140	110	100	817	332	141	333	432	299
24	169	389	245	140	110	100	823	298	132	299	964	277
25	162	327	240	140	110	105	858	272	129	240	850	259
26	158	310	235	140	105	105	890	282	127	223	603	248
27	152	300	230	140	105	105	875	344	122	364	483	317
28	147	280	225	140	105	110	849	317	115	287	648	303
29	141	270	220	140	---	115	815	285	110	242	677	306
30	137	260	215	140	---	120	746	261	105	213	546	363
31	136	---	210	140	---	130	---	238	---	182	465	---
TOTAL	8006	15946	7085	4870	3445	3195	16922	15369	5413	4551	10241	10506
MEAN	258	532	229	157	123	103	564	496	180	147	330	354
MAX	501	1020	270	205	140	130	890	1020	289	364	964	713
MIN	136	185	190	140	105	100	150	238	105	75	78	201
CFSM	1.41	2.91	1.25	.86	.67	.56	3.08	2.71	.98	.80	1.80	1.93
IN.	1.63	3.24	1.44	.99	.70	.65	3.44	3.12	1.10	.93	2.08	2.16
CAL YR 1977	TOTAL	82776	MEAN 227	MAX 1040	MIN 50	CFSM 1.24	IN 16.83					
WTR YR 1978	TOTAL	105649	MEAN 289	MAX 1020	MIN 75	CFSM 1.58	IN 21.48					

## STREAMS TRIBUTARY TO LAKE MICHIGAN

73

04057800 MIDDLE BRANCH ESCANABA RIVER AT HUMBOLDT, MI

LOCATION.--Lat 46°29'57", long 87°53'11", in SW¼ sec.1, T.47 N., R.29 W., Marquette County, Hydrologic Unit 04030110, on left bank 15 ft (5 m) upstream from county highway, 0.3 mi (0.5 km) north of Humboldt, and 1.5 mi (2.4 km) downstream from Halfway Creek.

DRAINAGE AREA.--46.0 mi<sup>2</sup> (119.1 km<sup>2</sup>).

## WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--June 1959 to current year.

REVISED RECORDS.--WSP 1911: Drainage area.

GAGE.--Water-stage recorder. V-notch sharp-crested weir since Oct. 3, 1960. Datum of gage is 1,521.20 ft (463.662 m) Cleveland-Cliffs Iron Co. datum. Prior to Sept. 1, 1960, nonrecording gage at same site and datum.

REMARKS.--Water-discharge records good. From July 1960 to June 1972, some diversion 100 ft (30 m) above station by industry for iron ore processing; figures of runoff adjusted.

AVERAGE DISCHARGE.--19 years, 60.2 ft<sup>3</sup>/s (1.705 m<sup>3</sup>/s), 17.77 in/yr (451 mm/yr), adjusted for diversion 1960 to 1972.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,640 ft<sup>3</sup>/s (46.4 m<sup>3</sup>/s) Apr. 24, 1960, gage height, 8.30 ft (2.530 m), from flood-mark; minimum, 4.0 ft<sup>3</sup>/s (0.11 m<sup>3</sup>/s) Sept. 12, 1976; minimum gage height, 1.07 ft (0.326 m) Aug. 24, 1960.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 1,370 ft<sup>3</sup>/s (38.8 m<sup>3</sup>/s) Sept. 12, gage height, 7.73 ft (2.356 m); minimum, 7.0 ft<sup>3</sup>/s (0.20 m<sup>3</sup>/s) Aug. 15, gage height, 1.68 ft (0.512 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	61	46	43	33	26	21	31	330	63	23	22	112
2	54	48	45	32	26	20	30	267	57	22	24	82
3	48	50	45	33	26	20	30	231	51	19	24	70
4	43	52	44	32	26	20	34	216	46	17	20	57
5	42	48	42	32	27	20	41	211	46	16	19	50
6	40	44	38	32	28	19	49	196	42	15	17	48
7	35	44	39	32	29	19	56	176	40	18	17	44
8	69	48	40	33	29	18	63	165	49	37	17	40
9	164	49	40	33	30	18	67	185	50	29	14	37
10	175	52	40	33	29	18	68	183	44	24	13	38
11	158	53	40	33	29	18	73	160	44	20	12	326
12	183	50	40	33	28	18	76	174	66	16	10	1220
13	185	47	40	33	26	18	81	172	59	16	9.7	862
14	145	45	40	33	25	18	77	186	49	16	9.4	490
15	111	44	41	32	24	18	74	214	44	29	10	395
16	92	49	39	32	23	18	82	187	46	19	59	305
17	81	51	39	31	23	18	100	144	50	16	50	221
18	89	52	42	30	22	18	123	114	120	35	34	163
19	87	50	44	31	22	17	137	94	115	41	32	130
20	77	55	42	29	22	17	131	82	77	105	28	118
21	71	87	43	28	22	17	128	73	66	96	21	93
22	64	86	43	28	22	17	139	65	55	53	18	82
23	58	65	42	29	22	17	179	59	47	77	96	71
24	56	60	40	28	22	17	227	53	42	61	250	62
25	54	57	40	26	22	18	280	50	40	54	214	53
26	53	54	38	26	22	18	349	52	40	59	128	52
27	52	53	37	26	21	21	386	53	37	41	103	59
28	52	51	37	26	21	23	413	60	33	28	270	66
29	48	47	36	26	---	24	459	60	28	30	383	71
30	46	45	35	26	---	25	427	80	24	33	276	85
31	44	---	34	26	---	28	---	75	---	28	171	---
TOTAL	2537	1582	1248	937	694	596	4410	4367	1570	1093	2371.1	5512
MEAN	81.8	52.7	40.3	30.2	24.8	19.2	147	141	52.3	35.3	76.5	184
MAX	185	87	45	33	30	28	459	330	120	105	383	1220
MIN	35	44	34	26	21	17	30	50	24	15	9.4	37
CFSM	1.78	1.15	.88	.66	.54	.42	3.20	3.07	1.14	.77	1.66	4.00
IN.	2.05	1.28	1.01	.76	.56	.48	3.57	3.53	1.27	.88	1.92	4.46
CAL YR 1977	TOTAL	17906.1	MEAN	49.1	MAX	476	MIN	5.0	CFSM	1.07	IN	14.48
WTR YR 1978	TOTAL	26917.1	MEAN	73.7	MAX	1220	MIN	9.4	CFSM	1.60	IN	21.77

## STREAMS TRIBUTARY TO LAKE MICHIGAN

04057800 MIDDLE BRANCH ESCANABA RIVER AT HUMBOLDT, MI--CONTINUED

## WATER-QUALITY RECORDS

## PERIOD OF DAILY RECORD.--

WATER TEMPERATURES: November 1972 to September 1978 (discontinued).

INSTRUMENTATION.--Temperature recorder since Nov. 10, 1972.

REMARKS.--Complete ice cover during winter period.

## EXTREMES FOR PERIOD OF DAILY RECORD.--

WATER TEMPERATURES: Maximum, 26.0°C July 19, 20, 1977; minimum, 0.0°C on many days during winter periods.

## EXTREMES FOR CURRENT YEAR.--

WATER TEMPERATURES: Maximum, 23.0°C June 29, Aug. 14; minimum, 0.0°C on many days during winter period.

## TEMPERATURE (DEG. C) OF WATER, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DAY	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN
	OCTOBER		NOVEMBER		DECEMBER		JANUARY		FEBRUARY		MARCH	
1	10.0	9.0	7.0	6.5	.5	.0	.0	.0	.0	.0	.0	.0
2	9.5	7.5	7.0	7.0	.0	.0	.0	.0	.0	.0	.0	.0
3	9.5	6.5	8.0	7.0	.0	.0	.0	.0	.0	.0	.0	.0
4	9.0	6.5	7.5	5.5	.0	.0	.0	.0	.0	.0	.0	.0
5	9.5	8.0	5.5	3.5	.0	.0	.0	.0	.0	.0	.0	.0
6	8.5	7.0	4.5	3.0	.0	.0	.0	.0	.0	.0	.0	.0
7	8.5	5.5	5.5	4.0	.0	.0	.0	.0	.0	.0	.0	.0
8	6.0	6.0	7.0	5.5	.0	.0	.0	.0	.0	.0	.0	.0
9	6.0	6.0	8.5	7.0	.0	.0	.0	.0	.0	.0	.0	.0
10	7.0	5.0	8.5	6.0	.0	.0	.0	.0	.0	.0	.0	.0
11	7.0	6.5	6.0	3.0	.0	.0	.0	.0	.0	.0	.0	.0
12	6.5	5.5	3.0	2.0	.0	.0	.0	.0	.0	.0	.0	.0
13	5.5	4.0	2.0	2.0	.0	.0	.0	.0	.0	.0	.0	.0
14	6.0	5.0	1.5	1.5	.0	.0	.0	.0	.0	.0	.0	.0
15	6.0	5.5	1.5	1.5	.0	.0	.0	.0	.0	.0	.0	.0
16	5.5	4.5	2.0	1.5	.0	.0	.0	.0	.0	.0	.0	.0
17	6.0	4.0	2.0	1.5	.0	.0	.0	.0	.0	.0	.0	.0
18	5.5	5.5	1.5	1.5	.0	.0	.0	.0	.0	.0	.0	.0
19	7.5	5.5	1.5	1.5	.0	.0	.0	.0	.0	.0	.0	.0
20	7.0	5.0	1.5	1.0	.0	.0	.0	.0	.0	.0	.0	.0
21	7.5	6.5	1.5	1.0	.0	.0	.0	.0	.0	.0	.0	.0
22	7.5	5.0	1.0	.5	.0	.0	.0	.0	.0	.0	.0	.0
23	6.0	4.0	.5	.5	.0	.0	.0	.0	.0	.0	1.0	.0
24	7.0	4.5	.5	.5	.0	.0	.0	.0	.0	.0	.0	.0
25	9.0	7.0	.5	.5	.0	.0	.0	.0	.0	.0	.5	.0
26	9.0	7.5	.5	.5	.0	.0	.0	.0	.0	.0	1.0	.0
27	9.0	7.0	.5	.5	.0	.0	.0	.0	.0	.0	1.5	.0
28	7.5	5.0	.5	.5	.0	.0	.0	.0	.0	.0	1.5	.0
29	6.5	4.5	.5	.5	.0	.0	.0	.0	---	---	2.5	.0
30	6.0	5.5	.5	.5	.0	.0	.0	.0	---	---	1.5	.0
31	7.0	5.5	---	---	.0	.0	.0	.0	---	---	1.5	.0
MONTH	10.0	4.0	8.5	.5	.5	.0	.0	.0	.0	.0	2.5	.0

## STREAMS TRIBUTARY TO LAKE MICHIGAN

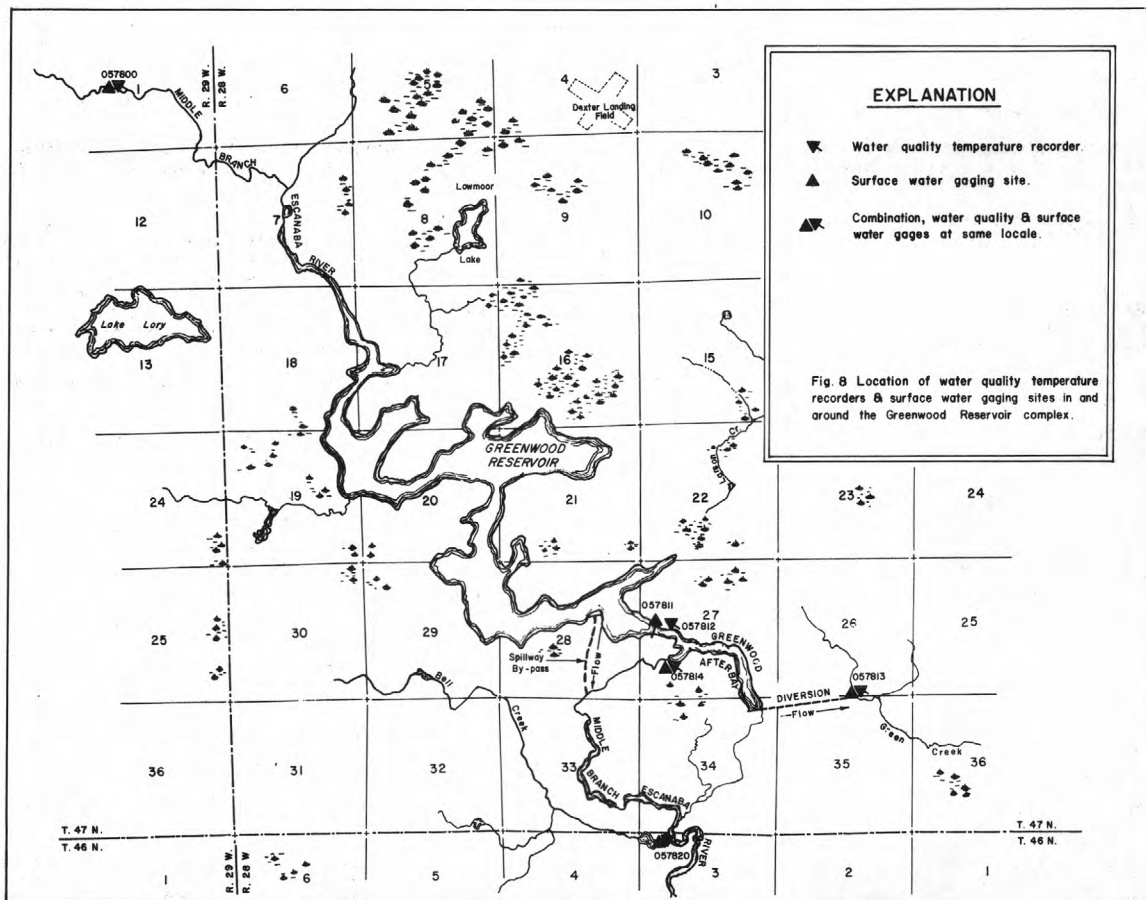
75

04057800 MIDDLE BRANCH ESCANABA RIVER AT HUMBOLDT, MI--CONTINUED

## TEMPERATURE (DEG. C) OF WATER, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DAY	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN
	APRIL		MAY		JUNE		JULY		AUGUST		SEPTEMBER	
1	1.0	.0	8.0	4.0	17.0	14.5	20.0	17.0	16.5	12.5	17.0	14.5
2	1.5	.0	8.0	5.0	16.0	13.5	18.5	15.5	17.5	14.5	18.5	16.0
3	1.0	.5	9.0	6.0	16.0	12.5	21.5	16.0	17.5	13.5	18.5	16.0
4	2.0	1.0	10.0	6.5	16.0	13.0	21.0	16.5	17.5	13.0	18.5	15.0
5	3.5	.5	10.5	7.0	16.5	11.0	21.5	17.0	19.0	14.0	18.5	16.5
6	2.0	.5	11.0	7.5	19.0	14.5	22.0	19.0	19.5	16.0	19.0	15.5
7	3.0	.5	11.5	7.5	19.0	12.5	22.0	18.5	20.0	15.5	19.0	16.5
8	2.5	.5	11.5	9.5	16.0	10.0	21.5	16.5	20.5	17.5	16.5	15.5
9	1.5	.5	9.5	7.5	16.5	12.0	20.5	16.5	20.5	16.0	16.0	15.0
10	.5	.5	11.5	6.5	17.0	11.5	18.0	14.0	18.0	14.0	18.0	15.0
11	1.5	.5	14.0	10.0	16.5	15.0	19.0	13.0	17.5	14.5	17.5	15.5
12	1.5	.5	13.5	9.0	15.5	13.0	18.0	15.0	19.5	15.5	16.0	13.5
13	1.5	.5	9.0	5.5	14.5	10.0	18.5	16.0	22.0	17.5	13.5	11.5
14	2.0	.5	5.5	5.0	14.5	10.0	18.5	14.0	23.0	19.0	12.0	11.5
15	2.5	.5	11.5	5.5	16.5	11.5	18.5	15.0	22.5	20.0	12.5	12.0
16	3.0	.5	15.5	10.0	16.5	13.5	19.0	13.5	21.5	18.0	12.0	10.5
17	3.0	.5	17.0	12.0	15.0	15.0	21.0	16.0	19.5	17.0	12.0	11.0
18	1.5	.5	18.5	13.0	18.0	15.0	21.0	17.5	19.5	17.5	12.0	11.5
19	1.0	.5	18.5	15.0	18.5	14.5	21.0	17.0	18.0	16.5	12.0	11.0
20	1.0	.5	17.5	12.5	18.5	16.5	20.0	17.5	17.5	13.5	12.0	12.0
21	2.5	.5	15.5	10.0	17.0	14.0	18.0	16.0	19.0	15.5	12.0	11.0
22	4.0	.5	17.0	11.5	18.5	12.5	16.5	15.0	19.0	17.5	11.0	9.0
23	3.0	.5	18.5	12.5	18.0	13.5	17.0	14.0	18.5	15.0	11.5	9.0
24	5.0	1.5	19.5	13.5	18.5	14.5	19.0	15.0	16.0	15.5	12.5	10.0
25	5.5	1.5	18.0	14.5	18.5	16.0	18.5	16.0	17.0	16.0	11.5	8.5
26	5.5	2.5	21.5	15.5	21.5	17.5	19.5	17.5	19.0	17.0	12.5	9.5
27	6.5	3.5	22.0	18.0	21.5	18.0	19.5	17.0	19.0	17.5	12.5	10.0
28	8.5	4.5	22.0	19.0	21.5	17.0	18.5	14.5	17.5	17.0	10.0	7.5
29	8.0	6.0	22.0	18.0	23.0	18.5	16.0	14.5	17.5	16.5	10.0	9.0
30	7.5	4.5	21.0	18.0	22.5	17.5	16.5	12.5	16.5	15.0	8.5	8.5
31	---	---	19.5	17.0	---	---	16.5	13.5	16.0	14.0	---	---
MONTH	8.5	.0	22.0	4.0	23.0	10.0	22.0	12.5	23.0	12.5	19.0	7.5





Greenwood Reservoir is formed by an earth/rockfill main dam (Greenwood Dam) and several earthfill dikes surrounding the storage area. Storage began Dec. 22, 1972, and the fixed-crest concrete spillway was completed in September 1973. The usable capacity of the reservoir is 23,300 acre-ft (28.7 hm<sup>3</sup>) at a spillway elevation of 1515 ft (461.8 m). At pool elevation exceeding 1515 ft (461.8 m), water flows over the spillway into the Middle Branch Escanaba River below Greenwood Release (04057814). At lower pool elevations, outflow from Greenwood Reservoir into Greenwood Afterbay is completely regulated by the multiport outlet of Greenwood Dam. Greenwood Afterbay has two outlets; one for diversion by pipeline into Green Creek and the second for releasing flows to Middle Branch Escanaba River. Water temperatures are measured directly below Greenwood Dam (Greenwood Afterbay, 04057813), and the gaging station below the release from the afterbay to Middle Branch Escanaba River (Greenwood Release, 04057814).

STREAMS TRIBUTARY TO LAKE MICHIGAN

77

04057811 GREENWOOD RESERVOIR NEAR GREENWOOD, MI

LOCATION.--Lat 46°26'32", long 87°48'02", in NW¼ SW¼ sec.27, T.47 N., R.28 W., Marquette County, Hydrologic Unit 04030110, at downstream side of dam, on Middle Branch Escanaba River, 3.7 mi (6.0 km) southwest of Greenwood.

DRAINAGE AREA.--67.4 mi<sup>2</sup> (174.6 km<sup>2</sup>).

PERIOD OF RECORD.--December 1972 to current year (monthend contents only).

GAGE.--Water-stage recorder. Datum of gage is 1,400.00 ft (246.720 m) National Geodetic Vertical Datum of 1929 (levels by Cleveland Cliffs Iron Co.); gage readings have been reduced to elevations NGVD. Prior to Feb. 20, 1973, nonrecording gage at same site and datum.

REMARKS.--The reservoir is formed by an earth/rockfill main dam and several earthfill dykes surrounding the storage area. Storage began Dec. 22, 1972. The fixed-crest concrete spillway was completed in September 1973. The usable capacity of the reservoir is 23,300 acre-ft (28.7 hm<sup>3</sup>) at spillway elevation 1,515 ft (461.8 m). Above elevation of 1,515 ft (461.8 m), water flows over concrete spillway into Middle Branch Escanaba River about 2,000 ft (610 m) below station 04057814. The main dam is equipped with an outlet structure with 4 valves to control flow to afterbay (conservation pool) which has a capacity of 420 acre-ft (518,000 m<sup>3</sup>) at elevation 1,480 ft (451.1 m). Two outlet systems from the afterbay provide for diversion and release flow. Diverted flow gaged at Greenwood Diversion (station 04057813); released flow to Middle Branch Escanaba River gaged at Greenwood Release (station 04057814). Reservoir impounds water for diversion to Schweitzer Reservoir (station 04058190), for use in iron ore processing.

EXTREMES FOR PERIOD OF RECORD.--Maximum contents, 25,260 acre-ft (31.1 hm<sup>3</sup>) Apr. 18, 1976, elevation, 1,516.4 ft (462.20 m); minimum since first filling, 3,240 acre-ft (3.99 hm<sup>3</sup>) Mar. 12, 1977, elevation, 1,491.1 ft (454.49 m).

EXTREMES FOR CURRENT YEAR.--Maximum contents, 24,700 acre-ft (30.5 hm<sup>3</sup>) Sept. 13, elevation, 1,516.0 ft (462.08 m); minimum, 20,460 acre-ft (25.2 hm<sup>3</sup>) Oct. 1, elevation, 1,512.8 ft (461.10 m).

MONTHEND ELEVATION, IN FEET NGVD, AND CONTENTS AT 2400, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

Date	Elevation (feet)	Contents (acre-feet)	Change in contents (acre-feet) (equivalent in ft <sup>3</sup> /s)	
Sept. 30 . . . . .	1512.8	20460	--	--
Oct. 31 . . . . .	1515.3	23720	+3260	+53.0
Nov. 30 . . . . .	1515.2	23580	-140	-2.4
Dec. 31 . . . . .	1515.0	23300	-280	-4.6
CAL YR 1977 . . . . .	--	--	+15170	+21.0
Jan. 31 . . . . .	1514.7	22910	-390	-6.3
Feb. 28 . . . . .	1514.3	22390	-520	-9.4
Mar. 31 . . . . .	1513.6	21480	-910	-14.8
Apr. 30 . . . . .	1515.6	24140	+2660	+44.7
May 31 . . . . .	1515.1	23440	-700	-11.4
June 30 . . . . .	1514.5	22650	-790	-13.3
July 31 . . . . .	1515.0	23300	+650	+10.6
Aug. 31 . . . . .	1515.4	23860	+560	+9.1
Sept. 30 . . . . .	1515.2	23580	-280	-4.7
WTR YR 1978 . . . . .	--	--	+3120	+4.3

## STREAMS TRIBUTARY TO LAKE MICHIGAN

04057812 GREENWOOD AFTERBAY NEAR GREENWOOD, MI

LOCATION.--Lat 46°26'32", long 87°48'02", in NW¼ SW¼ sec.27, T.47 N., R.28 W., Marquette County, Hydrologic Unit 04030110, in control house on downstream side of Greenwood Dam on the Middle Branch Escanaba River, 3.5 mi (5.6 km) southwest of Greenwood.

DRAINAGE AREA.--67.4 mi<sup>2</sup> (174.6 km<sup>2</sup>).

## PERIOD OF DAILY RECORD.--

WATER TEMPERATURES: January 1973 to current year.

INSTRUMENTATION.--Temperature recorder since Jan. 31, 1973.

REMARKS.--Temperature recorder malfunctioned June 1 to July 18. Flow regulated by the multi-port outlets of Greenwood Reservoir.

Altitude of outlets are: (No. 1) 1,505 ft (458.7 m), (No. 2) 1,495 ft (455.7 m), (No. 3) 1,485 ft (452.6 m), (No. 4) 1,478 ft (450.5 m) above mean sea level. Outlets open were: Oct. 1 to Sept. 30, No. 3; the No. 1 port was also opened sometime after Sept. 7.

## EXTREMES FOR PERIOD OF DAILY RECORD.--

WATER TEMPERATURES: Maximum, 24.5°C July 14, 15, 1974; minimum, freezing point on many days during January to March 1973.

## EXTREMES FOR CURRENT YEAR.--

WATER TEMPERATURES: Maximum recorded, 16.0°C Aug. 15, 22, 23, 28, 29, Sept. 10; minimum, 1.0°C Jan. 5-9.

## TEMPERATURE (DEG. C) OF WATER, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DAY	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN
	OCTOBER		NOVEMBER		DECEMBER		JANUARY		FEBRUARY		MARCH	
1	13.5	13.5	8.5	8.5	2.5	2.5	2.5	2.0	2.5	2.0	2.5	2.0
2	13.5	13.5	8.5	8.5	2.5	2.5	2.5	2.0	2.5	2.0	2.5	2.0
3	13.5	13.0	8.5	8.5	2.5	2.5	2.5	2.0	3.0	2.0	2.0	2.0
4	13.0	13.0	8.5	8.0	2.5	2.5	2.0	1.5	2.5	2.5	2.5	2.0
5	13.0	13.0	8.0	8.0	2.5	2.5	1.5	1.0	2.5	2.5	2.5	2.0
6	13.0	12.5	8.0	8.0	2.5	2.5	1.0	1.0	2.5	2.5	2.5	2.0
7	12.5	12.0	8.0	8.0	2.5	2.5	1.0	1.0	2.5	2.0	2.5	2.0
8	12.0	12.0	8.0	8.0	2.5	2.5	1.0	1.0	2.0	1.5	2.0	2.0
9	12.0	11.5	8.0	8.0	2.5	2.5	1.5	1.0	1.5	1.5	2.0	2.0
10	11.5	11.0	8.0	8.0	2.5	2.5	1.5	1.5	1.5	1.5	2.0	2.0
11	11.0	11.0	8.0	7.5	2.5	2.5	2.0	1.5	1.5	1.5	2.0	2.0
12	10.5	10.5	7.5	7.0	2.5	2.5	2.0	1.5	1.5	1.5	2.0	2.0
13	10.5	10.0	7.0	7.0	2.5	2.5	1.5	1.5	1.5	1.5	2.0	2.0
14	10.0	10.0	7.0	7.0	2.5	2.5	1.5	1.5	1.5	1.5	2.0	2.0
15	10.0	10.0	7.0	6.5	2.5	2.5	1.5	1.5	1.5	1.5	2.0	1.5
16	10.0	10.0	6.5	6.5	2.5	2.5	1.5	1.5	1.5	1.5	1.5	1.5
17	10.0	9.5	6.5	6.0	2.5	2.5	1.5	1.5	1.5	1.5	2.0	1.5
18	9.5	9.5	6.0	5.5	2.5	2.5	2.0	2.0	1.5	1.5	2.5	2.0
19	9.5	9.5	5.5	5.5	2.5	2.5	2.0	2.0	2.0	1.5	2.0	2.0
20	9.5	9.5	5.5	5.0	2.5	2.5	1.5	1.5	2.0	2.0	2.0	2.0
21	9.5	9.5	4.5	4.0	2.5	1.5	1.5	1.5	2.5	2.0	2.0	2.0
22	9.5	9.5	4.0	4.0	1.5	1.5	1.5	1.5	2.5	2.0	2.0	2.0
23	9.5	9.0	4.0	3.5	1.5	1.5	1.5	1.5	2.0	2.0	2.0	2.0
24	9.0	9.0	3.5	3.0	1.5	1.5	1.5	1.5	2.0	2.0	2.0	2.0
25	9.0	9.0	3.0	2.0	2.0	1.5	1.5	1.5	2.0	2.0	2.0	2.0
26	9.0	9.0	2.5	2.0	2.5	2.0	1.5	1.5	2.0	2.0	2.0	1.5
27	9.0	9.0	2.5	2.5	2.5	2.5	2.0	1.5	2.0	2.0	1.5	1.5
28	9.0	9.0	2.5	2.5	2.5	2.5	2.0	2.0	2.0	2.0	1.5	1.5
29	9.0	9.0	2.5	2.5	2.5	2.5	2.0	1.5	---	---	1.5	1.5
30	9.0	8.5	2.5	2.5	2.5	2.5	2.0	1.5	---	---	1.5	1.5
31	8.5	8.5	---	---	2.5	2.5	2.0	1.5	---	---	2.0	2.0
MONTH	13.5	8.5	8.5	2.0	2.5	1.5	2.5	1.0	3.0	1.5	2.5	1.5

STREAMS TRIBUTARY TO LAKE MICHIGAN

79

04057812 GREENWOOD AFTERBAY NEAR GREENWOOD, MI--CONTINUED

TEMPERATURE (DEG. C) OF WATER, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DAY	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN
	APRIL		MAY		JUNE		JULY		AUGUST		SEPTEMBER	
1	2.0	2.0	5.5	4.5			---	---	14.5	14.0	15.5	15.0
2	2.0	2.0	5.0	4.0			---	---	15.0	14.0	15.5	15.0
3	2.0	2.0	4.5	4.0			---	---	15.0	14.5	15.5	15.0
4	2.5	2.5	4.5	4.0			---	---	15.0	14.5	15.5	14.5
5	2.5	2.5	5.0	4.5			---	---	15.0	15.0	15.5	15.0
6	2.5	2.5	5.5	4.5			---	---	15.5	15.0	15.5	15.0
7	3.0	2.5	5.5	4.5			---	---	15.5	15.0	15.5	14.5
8	3.0	2.5	5.0	4.5			---	---	15.5	15.0	15.5	15.0
9	3.5	3.0	5.0	5.0			---	---	15.5	15.0	15.0	15.0
10	4.0	4.0	5.5	5.0			---	---	15.0	15.0	16.0	14.5
11	4.0	4.0	5.0	4.5			---	---	15.5	15.0	15.5	14.5
12	4.0	4.0	5.5	4.5			---	---	15.5	15.0	15.0	15.0
13	4.0	4.0	6.0	5.5			---	---	15.5	15.0	15.0	14.5
14	4.0	4.0	6.0	6.0			---	---	15.5	15.0	15.5	15.0
15	4.5	4.0	6.0	5.5			---	---	16.0	14.5	15.0	15.0
16	4.5	3.5	5.5	4.5			---	---	15.5	14.5	15.0	14.5
17	4.0	3.5	5.0	4.0			---	---	15.5	14.5	14.5	14.5
18	4.0	3.5	4.5	3.5			---	---	15.5	15.0	14.5	14.0
19	4.0	4.0	4.5	4.0			15.5	13.5	15.5	15.0	14.0	14.0
20	5.0	4.5	5.5	4.0			15.0	13.5	15.5	15.0	14.5	14.0
21	5.0	4.5	6.5	5.0			14.5	14.0	15.5	15.0	14.0	14.0
22	5.0	4.0	6.0	5.0			14.0	14.0	16.0	14.5	14.0	13.5
23	4.0	4.0	5.5	4.5			14.5	13.5	16.0	14.5	13.5	13.5
24	4.0	4.0	5.5	4.5			14.5	13.5	15.5	15.0	13.5	13.5
25	4.5	4.0	5.0	4.5			14.5	13.5	15.5	15.0	13.5	13.5
26	4.5	4.0	5.0	4.5			14.0	13.5	15.5	15.0	13.5	13.5
27	4.0	3.5	4.5	4.0			15.5	13.5	15.5	15.0	13.5	13.0
28	3.5	2.5	5.0	4.5			15.0	14.0	16.0	15.0	13.0	13.0
29	3.5	2.5	5.5	5.0			14.5	14.0	16.0	15.0	13.0	12.5
30	5.0	3.5	5.5	5.0			14.5	14.0	15.5	15.0	12.5	12.5
31	---	---	6.0	5.5			14.5	14.0	15.5	15.0	---	---
MONTH	5.0	2.0	6.5	3.5					16.0	14.0	16.0	12.5

## STREAMS TRIBUTARY TO LAKE MICHIGAN

## 04057813 GREENWOOD DIVERSION NEAR GREENWOOD, MI

LOCATION.--Lat 46°26'04", long 87°46'10", in NW¼ NE¼ sec.35, T.47 N., R.28 W., Marquette County, Hydrologic Unit 04030110, on left bank at downstream end of pipeline, 200 ft (61 m) upstream from Green Creek, 0.7 mi (1.1 km) downstream from Greenwood Afterbay, and 3.6 mi (5.8 km) south of Greenwood.

## WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--December 1972 to current year.

GAGE.--Water-stage recorder and concrete flume. Altitude of gage is 1,460 ft (445 m) from topographic map (nearest 10 ft). Prior to Aug. 22, 1973, nonrecording gage at same site and datum.

REMARKS.--Water-discharge records good. Flow completely regulated. A pipeline, 0.7 mi (1.1 km) long, diverts water from Greenwood Reservoir (station 04057811) into Green Creek, tributary to Schweitzer Reservoir (station 04058190). Water is used for iron ore processing and some returned to Middle Branch Escanaba River via another Green Creek (tributary to Middle Branch Escanaba River); 27 mi (43 km) below station.

EXTREMES FOR PERIOD OF RECORD.--Maximum daily discharge, 30 ft<sup>3</sup>/s (0.85 m<sup>3</sup>/s) June 25-28, 1977; no flow Dec. 27, 1972 to Jan. 6, 1973.

DISCHARGE IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	.06	.03	17	17	6.0	13	15	10	9.2	8.5	14	14
2	.06	.03	17	17	7.7	13	15	9.9	9.1	8.5	14	14
3	.06	.02	17	13	10	13	15	9.0	9.0	8.5	14	14
4	.06	.02	17	7.6	10	13	15	9.0	8.8	8.4	14	14
5	.06	.02	17	6.1	10	13	15	9.0	8.8	8.4	14	14
6	.06	.02	17	6.1	10	13	16	9.0	8.8	8.5	14	14
7	.06	.02	17	6.1	10	13	16	9.0	8.8	8.6	14	14
8	.06	.02	17	6.1	9.8	15	16	9.0	8.7	8.8	14	14
9	.06	.03	17	6.1	9.5	15	16	9.0	8.7	8.8	14	14
10	.06	.02	17	6.1	9.9	15	15	9.0	8.6	8.9	14	14
11	.06	.02	17	6.1	9.9	15	16	9.0	8.7	12	14	15
12	.06	.02	17	6.1	9.4	15	16	8.8	8.7	14	14	15
13	.06	.02	17	6.1	10	16	15	8.8	8.7	14	14	15
14	.06	.02	17	6.1	10	16	15	8.8	8.7	14	14	15
15	.06	.02	17	6.1	11	16	15	8.7	10	14	14	15
16	.06	.02	17	6.1	12	15	15	8.7	9.0	14	14	15
17	.04	.02	17	6.0	12	15	15	8.7	9.1	14	14	15
18	.03	.02	17	6.0	12	15	15	8.6	9.2	14	14	15
19	.03	.02	17	6.0	12	15	15	8.5	9.0	14	14	15
20	.03	.02	17	6.0	12	15	15	8.5	9.1	14	14	15
21	.03	.02	17	5.8	12	15	15	8.5	9.2	14	14	15
22	.03	.02	17	5.8	11	15	15	8.7	9.0	14	14	15
23	.03	.03	17	5.8	12	15	15	8.7	8.9	14	14	15
24	.03	18	17	5.8	12	15	15	8.7	8.8	14	14	15
25	.03	17	17	5.8	12	15	15	8.8	8.8	14	14	15
26	.03	17	17	6.0	12	15	14	9.0	8.7	14	14	15
27	.03	17	17	6.0	12	15	10	9.1	8.7	14	14	15
28	.03	18	17	6.0	11	16	10	9.3	8.6	14	14	15
29	.03	18	17	6.0	---	15	10	9.3	8.5	14	14	15
30	.03	18	17	6.0	---	15	10	9.4	8.5	14	14	15
31	.03	---	17	6.0	---	16	---	9.4	---	14	14	---
TOTAL	1.42	124.40	527	216.8	297.9	456	430	277.9	266.4	377.9	434	440
MEAN	.046	4.15	17.0	6.99	10.6	14.7	14.5	8.96	8.88	12.2	14.0	14.7
MAX	.06	18	17	17	12	16	16	10	10	14	14	15
MIN	.03	.02	17	5.8	6.0	13	10	8.5	8.5	8.4	14	14
CAL YR 1977	TOTAL	2881.42	MEAN	7.49	MAX	30	MIN	.02				
WTR YR 1978	TOTAL	3655.72	MEAN	10.6	MAX	18	MIN	.02				



STREAMS TRIBUTARY TO LAKE MICHIGAN

81

04057813 GREENWOOD DIVERSION NEAR GREENWOOD, MI--CONTINUED

WATER-QUALITY RECORDS

PERIOD OF DAILY RECORD.--

WATER TEMPERATURES: September 1973 to current year.

INSTRUMENTATION.--Temperature recorder since Aug. 31, 1973.

REMARKS.--Flow regulated by inlet structure of pipeline from Greenwood Afterbay 0.7 mile (1.1 km) above station.

EXTREMES FOR PERIOD OF DAILY RECORD.--

WATER TEMPERATURES: Maximum, 22.5°C July 18, 19, 1974; minimum, 0.5°C on many days during winter periods 1977, 1978.

EXTREMES FOR CURRENT YEAR.--

WATER TEMPERATURES: Maximum, 18.5°C Aug. 16, 17; minimum, 0.5°C Mar. 5-17, 20-28.

TEMPERATURE (DEG. C) OF WATER, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DAY	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN
	OCTOBER		NOVEMBER		DECEMBER		JANUARY		FEBRUARY		MARCH	
1	13.5	12.5	9.0	8.0	2.0	2.0	1.5	1.5	1.0	1.0	1.0	1.0
2	14.5	12.0	9.0	8.5	2.0	2.0	1.5	1.5	1.0	1.0	1.0	1.0
3	15.5	12.0	9.0	7.0	2.0	2.0	1.5	1.5	1.0	1.0	1.0	1.0
4	14.0	12.0	7.5	7.0	2.0	2.0	1.5	1.5	1.0	1.0	1.0	1.0
5	13.0	10.5	8.0	6.0	2.0	2.0	1.5	1.5	1.0	1.0	1.0	.5
6	13.0	10.5	8.0	6.5	2.0	2.0	1.5	1.5	1.0	1.0	1.0	.5
7	11.0	10.5	8.5	8.0	2.0	2.0	1.5	1.5	1.0	1.0	.5	.5
8	10.5	8.0	8.5	8.0	2.0	2.0	1.5	1.5	1.0	1.0	1.0	.5
9	11.5	10.0	8.5	8.5	2.0	2.0	1.5	1.5	1.0	1.0	.5	.5
10	12.5	10.0	8.5	5.0	2.0	2.0	1.5	1.5	1.0	1.0	.5	.5
11	10.5	9.0	5.0	4.0	2.0	2.0	1.5	1.5	1.0	1.0	.5	.5
12	10.0	9.0	5.0	3.5	2.0	2.0	1.5	1.5	1.0	1.0	.5	.5
13	11.0	9.0	4.5	3.5	2.0	1.5	1.5	1.5	1.0	1.0	.5	.5
14	11.0	9.0	6.0	4.5	1.5	1.5	1.5	1.5	1.0	1.0	.5	.5
15	10.0	9.0	6.0	4.5	1.5	1.5	1.5	1.5	1.0	1.0	.5	.5
16	10.5	9.0	6.0	4.5	1.5	1.5	1.5	1.5	1.0	1.0	.5	.5
17	11.0	8.5	5.0	4.0	1.5	1.5	1.5	1.5	1.0	1.0	.5	.5
18	9.0	8.5	4.5	3.5	1.5	1.5	1.5	1.5	1.0	1.0	1.0	1.0
19	12.0	8.0	5.0	3.5	1.5	1.5	1.5	1.5	1.0	1.0	1.0	1.0
20	12.0	7.5	5.5	2.0	1.5	1.5	1.5	1.5	1.0	1.0	1.0	.5
21	11.0	8.0	2.5	1.5	1.5	1.5	1.5	1.5	1.0	1.0	.5	.5
22	9.5	7.5	3.0	2.0	1.5	1.5	1.5	1.5	1.0	1.0	.5	.5
23	10.0	7.0	3.5	2.0	1.5	1.5	1.5	1.5	1.0	1.0	.5	.5
24	11.0	7.5	2.0	2.0	1.5	1.5	1.5	1.5	1.0	1.0	.5	.5
25	11.0	9.0	2.0	2.0	1.5	1.5	1.5	1.0	1.0	1.0	.5	.5
26	10.5	8.5	2.0	2.0	1.5	1.5	1.0	1.0	1.0	1.0	.5	.5
27	10.0	8.0	2.0	2.0	1.5	1.5	1.0	1.0	1.0	1.0	.5	.5
28	9.0	7.0	2.0	2.0	1.5	1.5	1.0	1.0	1.0	1.0	1.0	.5
29	9.0	7.0	2.0	2.0	1.5	1.5	1.0	1.0	---	---	1.5	1.0
30	9.0	8.0	2.0	2.0	1.5	1.5	1.0	1.0	---	---	1.5	1.5
31	9.0	8.0	---	---	1.5	1.5	1.0	1.0	---	---	1.5	1.5
MONTH	15.5	7.0	9.0	1.5	2.0	1.5	1.5	1.0	1.0	1.0	1.5	.5

STREAMS TRIBUTARY TO LAKE MICHIGAN  
04057813 GREENWOOD DIVERSION NEAR GREENWOOD, MI--CONTINUED

TEMPERATURE (DEG. C) OF WATER, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DAY	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN
	APRIL		MAY		JUNE		JULY		AUGUST		SEPTEMBER	
1	1.5	1.5	5.5	4.5	11.0	10.5	14.5	14.0	16.0	16.0	17.0	17.0
2	1.5	1.5	5.0	4.0	11.0	11.0	14.5	14.5	16.0	16.0	17.0	17.0
3	1.5	1.5	5.5	5.5	11.0	11.0	14.5	14.5	16.5	16.0	17.5	17.0
4	2.0	1.5	5.5	5.5	11.0	11.0	14.5	14.5	16.5	16.0	17.5	17.0
5	1.5	1.5	6.0	5.5	11.5	11.0	14.5	14.5	16.5	16.0	17.0	17.0
6	2.0	1.5	6.5	5.5	11.5	11.0	14.5	14.5	17.0	16.5	17.0	17.0
7	2.0	2.0	7.5	6.0	11.5	11.0	14.5	14.5	17.0	17.0	17.0	17.0
8	2.0	2.0	9.0	6.5	11.5	11.5	14.5	14.5	17.0	17.0	17.0	17.0
9	2.0	2.0	9.0	7.5	11.5	11.5	14.5	14.5	17.5	17.0	17.0	17.0
10	2.5	2.0	8.5	8.5	11.5	11.5	15.0	14.5	17.5	17.5	17.0	15.5
11	2.5	2.0	9.0	8.0	12.0	11.5	15.5	15.0	17.5	17.0	16.5	16.5
12	2.0	2.0	10.0	8.0	12.0	12.0	15.5	15.0	17.0	17.0	17.0	15.5
13	2.0	2.0	9.5	9.0	12.0	12.0	15.5	15.0	17.5	17.0	16.5	15.5
14	2.0	2.0	8.5	8.5	12.0	12.0	16.0	15.5	17.5	17.5	15.5	15.0
15	2.0	2.0	8.0	8.0	12.0	12.0	16.5	16.0	18.0	17.5	15.0	14.5
16	2.5	2.0	7.5	7.0	12.0	12.0	17.0	16.5	18.5	18.0	14.5	14.5
17	2.5	2.5	7.5	7.0	12.0	12.0	17.0	16.5	18.5	17.5	14.5	14.5
18	3.0	2.5	8.0	7.5	12.0	12.0	17.0	16.5	17.5	17.5	14.5	14.5
19	3.5	3.0	8.5	7.5	12.0	12.0	17.0	16.5	17.5	17.5	14.5	14.5
20	3.5	3.5	9.0	8.0	12.5	12.0	17.0	16.5	17.5	17.5	14.5	14.5
21	3.5	2.5	9.0	9.0	12.5	12.5	17.0	16.5	17.5	17.0	14.5	14.5
22	2.5	2.5	9.5	9.0	12.5	12.5	16.5	16.0	17.5	17.0	14.5	14.5
23	3.0	2.5	10.0	9.5	13.0	12.5	16.0	15.5	17.5	17.5	14.5	14.0
24	3.5	3.0	10.5	9.5	13.0	13.0	15.5	15.5	17.5	17.0	14.0	14.0
25	3.5	3.5	10.5	10.0	13.0	13.0	16.5	15.5	17.0	17.0	14.5	14.0
26	3.5	3.5	10.5	10.5	13.0	13.0	16.5	16.5	17.0	17.0	14.5	14.5
27	3.5	3.5	10.5	10.5	13.0	13.0	16.5	16.5	17.0	17.0	14.5	14.5
28	4.0	3.5	10.5	10.5	13.0	13.0	16.5	16.5	17.0	17.0	14.5	14.0
29	4.0	4.0	10.5	10.5	13.5	13.0	16.5	16.5	17.5	17.0	14.0	13.5
30	4.5	4.5	10.5	10.5	14.0	13.5	16.5	16.0	17.5	17.5	13.5	13.0
31	---	---	10.5	10.5	---	---	16.0	15.5	17.5	17.0	---	---
MONTH	4.5	1.5	10.5	4.0	14.0	10.5	17.0	14.0	18.5	16.0	17.5	13.0

## 83

LOCATION.--Lat 46°26'22", long 87°47'52", in NW¼ SW¼ sec.27, T.47 N., R.28 W., Marquette County, Hydrologic Unit 04030110, on left bank at outlet of Greenwood Afterbay releasing to Middle Branch Escanaba River, 2.6 mi (4.2 km) upstream from Bell Creek and 3.8 mi (6.1 km) southwest of Greenwood.

WATER-DISCHARGE RECORDS

GAGE.--Water-stage recorder and concrete flume. Altitude of gage is 1,480 ft (451 m) from topographic map (nearest 10 ft). Prior to Nov. 7, 1973, nonrecording gage at same site and different datum.

REMARKS.--Water-discharge records good. Since December 1972, flow from Greenwood Reservoir (station 04057811) below spillway elevation 1,515 ft (462 m) is completely regulated by the afterbay release structure into the Middle Branch Escanaba River. Since January 1973, water is diverted immediately above this station (see station 04057813) to Green Creek for iron ore processing and some returned via another Green Creek to Middle Branch Escanaba River 27 mi (43 km) below this station. Overflow from the reservoir spillway bypasses and returns to the Middle Branch Escanaba River 0.5 mi (0.8 km) below this station.

EXTREMES FOR PERIOD OF RECORD.--Maximum daily discharge (prior to regulation), 290 ft<sup>3</sup>/s (8.21 m<sup>3</sup>/s) Oct. 1, 1972; (since regulation began), 63 ft<sup>3</sup>/s (1.78 m<sup>3</sup>/s) July 10, 11, 1974; minimum daily, 10 ft<sup>3</sup>/s (0.28 m<sup>3</sup>/s) Dec. 29, 30, 1972, result of construction.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	26	25	25	25	26	24	25	26	27	25	25	26
2	26	25	25	25	26	24	25	26	26	25	25	26
3	26	25	25	25	25	24	25	26	26	25	25	26
4	26	25	25	25	25	24	25	26	26	24	25	26
5	26	25	25	25	25	24	25	26	26	24	25	26
6	26	25	25	26	25	24	25	26	25	25	24	26
7	26	25	25	26	25	24	25	26	25	25	24	26
8	26	25	25	26	25	24	25	27	25	26	24	25
9	27	25	25	26	25	24	25	27	25	26	24	25
10	27	25	25	25	25	24	25	27	25	27	24	25
11	27	25	25	25	25	24	25	26	25	27	24	27
12	27	25	25	25	25	24	25	26	25	26	25	27
13	27	25	25	25	25	24	26	26	25	25	25	27
14	27	25	25	25	25	24	26	26	25	25	25	27
15	27	25	25	25	25	24	26	26	25	25	25	27
16	27	25	25	25	25	25	25	26	26	25	25	27
17	27	25	25	25	25	25	25	25	26	24	25	27
18	27	25	25	25	25	25	25	25	27	24	25	27
19	27	25	25	25	25	25	25	25	27	24	25	27
20	27	26	25	25	25	24	25	25	27	24	25	27
21	27	26	25	25	25	24	26	25	28	24	25	26
22	27	26	25	25	25	24	26	25	27	24	25	26
23	27	26	25	25	25	24	26	25	26	25	26	26
24	27	26	25	25	25	25	26	25	26	25	26	26
25	26	25	25	25	25	25	26	25	26	25	26	26
26	26	25	25	25	25	25	26	26	25	25	26	26
27	25	25	25	26	24	25	26	26	25	25	26	26
28	25	26	25	26	24	25	26	27	25	25	27	26
29	25	26	25	26	---	25	26	27	25	25	26	26
30	25	26	25	26	---	25	26	28	25	25	26	26
31	25	---	25	26	---	25	---	28	---	25	26	---
TOTAL	817	758	775	784	700	756	763	806	772	774	779	787
MEAN	26.4	25.3	25.0	25.3	25.0	24.4	25.4	26.0	25.7	25.0	25.1	26.2
MAX	27	26	25	26	26	25	26	28	28	27	27	27
MIN	25	25	25	25	24	24	25	25	25	24	24	25
CAL YR 1977	TOTAL	9081	MEAN 24.9	MAX 28	MIN 15							
WTR YR 1978	TOTAL	9271	MEAN 25.4	MAX 28	MIN 24							

## STREAMS TRIBUTARY TO LAKE MICHIGAN

04057814 GREENWOOD RELEASE NEAR GREENWOOD, MI--CONTINUED

## WATER-QUALITY RECORDS

PERIOD OF DAILY RECORD.--

WATER TEMPERATURES: September 1973 to current year.

INSTRUMENTATION.--Temperature recorder since Sept. 1, 1973.

REMARKS.--Flow regulated by valve at outlet of Greenwood Afterbay.

EXTREMES FOR PERIOD OF DAILY RECORD.--

WATER TEMPERATURES.--Maximum, 23.5°C July 14, 15, 1974; minimum, 0.5°C on several days during February and March, 1978.

EXTREMES FOR CURRENT YEAR.--

WATER TEMPERATURES: Maximum, 18.0°C Sept. 6; minimum, 0.5°C on several days during February and March.

## TEMPERATURE (DEG. C) OF WATER, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DAY	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN
	OCTOBER		NOVEMBER		DECEMBER		JANUARY		FEBRUARY		MARCH	
1	13.0	12.5	8.0	8.0	2.0	2.0	2.0	2.0	1.0	1.0	1.5	1.5
2	13.0	12.0	8.0	8.0	2.0	2.0	2.0	2.0	1.0	1.0	1.5	1.5
3	13.5	11.5	8.0	8.0	2.0	2.0	2.0	2.0	1.0	1.0	1.5	1.5
4	12.5	11.5	8.0	7.5	2.0	2.0	2.0	2.0	1.0	1.0	1.5	1.5
5	12.0	11.0	7.5	7.0	2.0	2.0	2.0	2.0	1.0	1.0	1.5	1.5
6	11.0	10.5	7.5	7.0	2.0	2.0	2.0	2.0	1.0	1.0	1.5	1.5
7	11.0	10.0	7.5	7.0	2.0	2.0	2.0	2.0	1.0	1.0	1.5	1.5
8	10.0	9.5	7.5	7.5	2.0	2.0	2.0	1.5	1.0	1.0	1.5	1.5
9	9.5	9.0	8.0	7.5	2.0	2.0	1.5	1.5	1.0	1.0	.5	.5
10	10.0	9.0	8.0	6.5	2.0	2.0	1.5	1.5	1.0	1.0	1.0	.5
11	10.0	9.0	6.5	4.5	2.0	2.0	1.5	1.5	1.0	.5	1.0	.5
12	9.0	8.5	4.5	4.0	2.0	2.0	1.5	1.5	.5	.5	1.0	1.0
13	9.0	8.0	4.5	4.5	2.0	2.0	2.0	1.5	.5	.5	1.0	1.0
14	9.0	8.5	5.0	4.5	2.0	2.0	2.0	2.0	.5	.5	1.0	1.0
15	9.0	8.5	5.0	5.0	2.0	1.5	2.0	2.0	.5	.5	1.0	.5
16	8.5	8.0	5.0	5.0	1.5	1.5	2.0	2.0	.5	.5	2.0	2.0
17	8.5	8.0	5.0	4.5	1.5	1.5	2.0	2.0	.5	.5	2.0	2.0
18	8.5	8.0	4.5	4.0	1.5	1.5	2.0	2.0	.5	.5	2.0	2.0
19	9.0	8.0	4.0	3.5	1.5	1.5	2.0	2.0	1.0	.5	2.0	2.0
20	9.0	8.0	4.0	3.5	1.5	1.5	2.0	2.0	1.5	1.0	2.0	2.0
21	9.0	8.5	3.5	2.0	1.5	1.5	2.0	2.0	1.5	1.0	2.0	2.0
22	8.5	8.0	3.0	2.0	1.5	1.5	2.0	2.0	1.5	1.5	2.0	2.0
23	8.0	7.5	3.0	3.0	1.5	1.5	2.0	2.0	1.5	1.5	2.0	2.0
24	8.0	8.0	3.0	3.0	1.5	1.5	2.0	2.0	1.5	1.5	2.0	2.0
25	9.0	8.0	3.0	2.5	1.5	1.5	1.5	1.5	1.5	1.5	2.0	2.0
26	9.0	8.5	2.5	2.0	1.5	1.5	1.5	1.0	1.5	1.5	2.0	2.0
27	9.0	8.5	2.5	2.0	2.0	1.5	1.0	1.0	1.5	1.5	2.0	2.0
28	9.0	8.0	2.0	2.0	2.0	2.0	1.0	1.0	1.5	1.5	2.0	2.0
29	8.5	7.5	2.5	2.5	2.0	2.0	1.0	1.0	---	---	2.0	1.5
30	8.0	8.0	2.5	2.0	2.0	2.0	1.0	1.0	---	---	2.0	1.5
31	8.0	8.0	---	---	2.0	2.0	1.0	1.0	---	---	1.5	1.5
MONTH	13.5	7.5	8.0	2.0	2.0	1.5	2.0	1.0	1.5	.5	2.0	.5

## STREAMS TRIBUTARY TO LAKE MICHIGAN

85

04057814 GREENWOOD RELEASE NEAR GREENWOOD, MI--CONTINUED

## TEMPERATURE (DEG. C) OF WATER, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DAY	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN
	APRIL		MAY		JUNE		JULY		AUGUST		SEPTEMBER	
1	1.5	1.0	6.0	3.5	11.5	9.5	14.5	12.5	16.0	14.0	16.5	15.5
2	1.5	1.0	6.5	4.0	10.5	8.5	14.0	12.5	16.5	14.5	17.0	15.5
3	1.5	1.0	6.5	4.5	11.0	8.5	16.5	12.5	15.5	14.0	17.0	15.5
4	2.0	1.5	6.5	4.5	10.0	9.0	15.5	13.0	17.0	14.0	17.5	15.5
5	2.5	1.5	7.5	5.5	11.0	8.0	17.5	13.0	17.5	14.5	17.0	15.0
6	2.5	1.5	8.0	5.5	11.5	9.0	15.5	13.0	16.5	14.5	18.0	15.5
7	3.0	1.5	8.0	6.0	11.5	8.5	15.5	13.5	17.0	15.0	17.0	15.5
8	3.0	1.5	8.0	6.5	11.0	7.5	16.0	12.5	17.5	15.0	15.5	15.5
9	3.0	1.5	6.5	6.0	12.0	8.5	14.5	13.5	17.0	15.0	15.5	15.0
10	1.5	1.5	9.0	6.0	12.0	8.5	14.5	12.0	16.5	14.5	16.5	15.0
11	2.5	1.5	10.0	7.0	12.0	9.5	15.0	12.5	16.5	15.0	16.5	15.5
12	2.5	2.0	9.0	7.0	10.0	9.0	14.5	13.0	17.5	15.0	15.5	14.5
13	2.0	2.0	7.0	6.5	12.0	8.0	15.0	13.0	17.5	15.5	14.5	13.5
14	2.5	1.5	7.0	6.5	10.5	8.5	15.5	12.5	16.5	15.5	15.0	14.0
15	3.0	2.0	11.0	7.0	11.5	9.5	16.0	13.0	17.5	15.5	15.0	14.5
16	4.0	2.5	11.0	8.5	13.0	10.0	15.5	12.5	17.0	15.5	15.0	14.5
17	4.5	3.0	12.0	9.0	13.0	10.5	15.0	13.5	16.0	15.0	15.5	15.0
18	4.5	3.0	13.0	9.5	13.5	10.5	16.0	13.5	16.0	15.5	15.0	14.5
19	3.0	3.0	12.0	9.5	13.0	11.0	15.5	13.5	16.0	15.0	14.5	14.5
20	3.0	2.0	11.0	8.5	14.5	12.0	15.0	13.5	16.0	14.5	14.5	14.5
21	4.5	2.5	10.0	7.0	12.5	10.5	14.5	13.0	16.5	15.0	14.5	14.0
22	4.5	3.0	10.0	8.0	14.5	11.0	14.0	13.5	16.5	15.5	15.0	13.5
23	4.5	3.0	12.5	9.0	13.5	11.5	16.5	13.0	16.0	15.0	14.5	13.5
24	4.5	3.0	13.0	9.0	13.5	11.5	16.0	13.5	16.0	15.0	15.0	13.5
25	4.5	3.0	11.0	9.0	13.0	12.5	16.0	14.0	16.0	15.5	14.5	13.5
26	5.0	3.0	11.5	9.0	15.5	13.5	16.5	14.0	16.0	15.5	14.5	13.5
27	6.0	3.5	13.0	10.5	15.5	13.0	16.5	14.0	16.0	15.5	14.5	13.5
28	6.5	3.5	13.5	10.0	15.5	12.5	15.5	14.0	16.5	15.5	13.5	12.5
29	6.5	4.0	13.0	10.0	16.5	13.5	15.5	14.0	16.5	15.5	13.5	12.5
30	6.0	4.0	14.5	10.0	15.0	13.5	15.0	13.5	16.5	15.0	12.5	12.5
31	---	---	12.5	9.5	---	---	15.5	14.0	16.5	15.0	---	---
MONTH	6.5	1.0	14.5	3.5	16.5	7.5	17.5	12.0	17.5	14.0	18.0	12.5



## STREAMS TRIBUTARY TO LAKE MICHIGAN

04057820 MIDDLE BRANCH ESCANABA RIVER NEAR GREENWOOD, MI

LOCATION.--Lat 46°25'12", long 87°47'50", in NW¼ sec.3, T.46 N., R.28 W., Marquette County, Hydrologic Unit 04030110, on right bank 10 ft (3 m) downstream from county highway bridge, 100 ft (30 m) downstream from Bell Creek and 5.0 mi (8.0 km) southwest of Greenwood.

DRAINAGE AREA.--73.3 mi<sup>2</sup> (189.8 km<sup>2</sup>).

## WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--Occasional low-flow measurements, water years 1961-71, and annual maximum, water years 1970-72, October 1972 to current year.

GAGE.--Water-stage recorder. Altitude of gage is 1,400 ft (427 m) from topographic map (nearest 10 ft). Prior to Sept. 20, 1973, nonrecording gage and crest-stage gage at same site and datum.

REMARKS.--Water-discharge records fair. Since December 1972, considerable regulation 2.1 mi (3.4 km) above station (see station 04057814) and 2.6 mi (4.2 km) above station (see station 04057811). Since January 1973, flow diverted 2.3 mi (3.7 km) above station at Greenwood Afterbay, to Green Creek (station 04057813) for iron ore processing and some returned to Middle Branch Escanaba River 24 mi (39 km) below station via another Green Creek.

AVERAGE DISCHARGE.--6 years, 82.0 ft<sup>3</sup>/s (2.322 m<sup>3</sup>/s), 15.19 in/yr (386 mm/yr), adjusted for storage and diversion.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,060 ft<sup>3</sup>/s (30.0 m<sup>3</sup>/s) May 5, 1972, gage height, 13.35 ft (4.069 m); minimum daily, 12 ft<sup>3</sup>/s (0.34 m<sup>3</sup>/s) Dec. 28, 1972, Jan. 2-4, Nov. 5, 1973, result of construction upstream.

EXTREMES OUTSIDE PERIOD OF RECORD.--A discharge of 8.62 ft<sup>3</sup>/s (0.24 m<sup>3</sup>/s) was measured Aug. 22, 1962.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 969 ft<sup>3</sup>/s (27.4 m<sup>3</sup>/s) Sept. 13, gage height, 12.68 ft (3.865 m); minimum daily, 25 ft<sup>3</sup>/s (0.71 m<sup>3</sup>/s) Aug. 5-14.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	36	61	39	27	28	26	28	496	81	29	30	158
2	35	64	41	27	28	26	28	404	76	28	29	119
3	35	68	39	27	28	26	28	326	68	27	29	94
4	34	70	35	27	28	26	28	283	64	27	27	73
5	33	67	34	28	28	26	28	259	62	27	25	64
6	33	64	33	28	28	26	28	238	58	27	25	59
7	33	63	32	28	28	26	29	213	54	27	25	52
8	39	63	32	28	28	27	30	207	54	28	25	47
9	44	62	36	27	28	27	30	209	54	28	25	44
10	43	62	35	27	28	27	31	207	51	28	25	44
11	44	66	34	27	28	27	31	198	52	28	25	341
12	45	62	34	27	28	27	31	196	62	28	25	669
13	43	58	34	28	28	27	33	195	62	28	25	951
14	41	55	31	28	28	27	34	202	60	28	25	838
15	40	54	30	28	28	27	34	204	54	29	27	612
16	39	54	29	28	28	27	34	205	54	29	31	456
17	48	54	29	28	28	27	34	190	57	28	28	330
18	69	59	30	28	28	27	39	168	65	30	29	248
19	85	56	33	28	28	26	72	145	77	30	30	193
20	94	59	34	28	28	27	117	130	80	34	28	168
21	95	72	37	28	28	27	122	111	76	32	28	138
22	89	73	38	28	27	27	134	98	67	32	28	122
23	85	75	36	28	27	26	157	89	58	39	43	110
24	80	72	35	28	27	26	196	79	52	44	54	95
25	80	63	37	28	27	28	256	70	48	50	94	85
26	77	57	38	28	26	27	330	68	47	51	124	78
27	73	52	38	28	26	27	409	67	43	50	130	88
28	70	47	36	28	26	27	467	80	39	41	213	87
29	67	42	37	28	---	27	512	80	36	39	261	91
30	62	39	40	28	---	27	546	84	32	33	283	98
31	60	---	43	28	---	27	---	84	---	31	214	---
TOTAL	1751	1813	1089	860	774	828	3876	5585	1743	1010	2010	6552
MFAN	56.5	60.4	35.1	27.7	27.6	26.7	129	180	58.1	32.6	64.8	218
MAX	95	75	43	28	28	28	546	496	81	51	283	951
MIN	33	39	29	27	26	26	28	67	32	27	25	44

CAL YR 1977 TOTAL 12769 MEAN 35.0 MAX 95 MIN 18 MEAN+ 63.9 CFSM+ 0.87 IN+ 11.84  
WTR YR 1978 TOTAL 27891 MEAN 76.4 MAX 951 MIN 25 MEAN+ 91.3 CFSM+ 1.25 IN+ 16.91

+Adjusted for diversion and change in contents in Greenwood Reservoir.

## STREAMS TRIBUTARY TO LAKE MICHIGAN

87

04057820 MIDDLE BRANCH ESCANABA RIVER NEAR GREENWOOD, MI--CONTINUED

## WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1973 to 1978 (discontinued).

PERIOD OF DAILY RECORD.--

WATER TEMPERATURES: August 1973 to September 1978.

INSTRUMENTATION.--Temperature recorder since Aug. 22, 1973.

REMARKS.--Temperature recorder malfunctioned Nov. 12 to Dec. 5, May 5-20. Flow regulated by Greenwood Release (station 04057814) 2.1 mi (3.4 km) above station.

EXTREMES FOR PERIOD OF DAILY RECORD.--

WATER TEMPERATURES: Maximum, 26.0°C July 8, 1974; minimum, 0.0°C on many days during winter periods.

EXTREMES FOR CURRENT YEAR.--

WATER TEMPERATURES: Maximum, 21.0°C July 24, 26, 27, Aug. 13, 14; minimum, 0.0°C Feb. 8-12.

## TEMPERATURE (DEG. C) OF WATER, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DAY	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN
	OCTOBER		NOVEMBER		DECEMBER		JANUARY		FEBRUARY		MARCH	
1	12.5	12.0	8.0	8.0	---	---	.5	.5	.5	.5	1.0	1.0
2	12.0	11.0	8.0	8.0	---	---	.5	.5	.5	.5	1.0	1.0
3	12.0	11.0	8.0	8.0	---	---	.5	.5	1.0	.5	1.0	1.0
4	10.5	10.0	8.0	7.5	---	---	.5	.5	.5	.5	1.0	1.0
5	11.0	10.0	7.5	7.0	---	---	.5	.5	.5	.5	1.0	1.0
6	10.0	10.0	7.0	7.0	1.0	1.0	.5	.5	.5	.5	1.0	1.0
7	10.0	8.0	7.5	7.0	1.0	.5	1.0	.5	.5	.5	1.0	1.0
8	8.0	7.5	8.0	7.5	.5	.5	1.0	.5	.0	.0	1.0	1.0
9	7.5	6.5	8.0	8.0	.5	.5	.5	.5	.0	.0	1.5	1.0
10	8.0	6.5	8.0	7.0	.5	.5	.5	.5	.0	.0	1.5	1.5
11	8.0	7.5	7.0	5.5	1.0	.5	.5	.5	.0	.0	3.0	1.0
12	7.5	7.0	---	---	.5	.5	.5	.5	.5	.0	3.0	1.5
13	7.0	6.0	---	---	.5	.5	.5	.5	1.0	.5	2.5	2.0
14	7.5	6.5	---	---	1.0	.5	.5	.5	1.0	1.0	2.0	2.0
15	7.5	7.5	---	---	1.0	1.0	.5	.5	1.0	1.0	2.0	1.5
16	7.5	6.0	---	---	1.0	1.0	.5	.5	1.0	.5	2.0	1.5
17	7.5	6.0	---	---	1.5	1.0	.5	.5	1.0	.5	1.5	1.0
18	7.5	7.5	---	---	1.5	1.0	.5	.5	.5	.5	1.5	1.0
19	8.5	7.5	---	---	1.5	1.0	.5	.5	.5	.5	2.0	1.0
20	8.5	7.5	---	---	1.5	1.0	.5	.5	.5	.5	2.0	1.0
21	8.5	8.5	---	---	1.0	1.0	.5	.5	.5	.5	2.0	1.0
22	8.5	7.5	---	---	1.0	1.0	.5	.5	.5	.5	2.5	2.0
23	7.5	7.0	---	---	1.0	.5	.5	.5	.5	.5	2.5	1.5
24	8.5	7.5	---	---	.5	.5	1.0	.5	1.0	.5	2.0	1.0
25	9.0	8.5	---	---	.5	.5	.5	.5	1.0	1.0	2.5	1.0
26	9.0	8.0	---	---	.5	.5	1.0	.5	1.0	1.0	3.0	1.0
27	9.0	8.5	---	---	.5	.5	1.0	.5	1.0	1.0	3.0	2.0
28	9.0	8.0	---	---	.5	.5	.5	.5	1.0	1.0	3.0	2.5
29	8.5	8.0	---	---	.5	.5	.5	.5	---	---	3.0	2.0
30	8.0	8.0	---	---	.5	.5	.5	.5	---	---	2.5	2.5
31	8.0	8.0	---	---	.5	.5	.5	.5	---	---	2.5	2.5
MONTH	12.5	6.0					1.0	.5	1.0	.0	3.0	1.0

## STREAMS TRIBUTARY TO LAKE MICHIGAN

04057820 MIDDLE BRANCH ESCANABA RIVER NEAR GREENWOOD, MI--CONTINUED

## TEMPERATURE (DEG. C) OF WATER, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DAY	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN
	APRIL		MAY		JUNE		JULY		AUGUST		SEPTEMBER	
1	2.5	2.5	5.5	5.5	13.0	11.5	15.0	12.5	18.5	15.0	19.0	14.0
2	3.0	3.0	5.5	5.5	12.0	10.5	13.5	12.0	19.0	16.5	20.0	18.0
3	3.0	3.0	5.5	5.5	12.5	10.0	16.5	12.5	18.5	15.5	19.0	17.5
4	3.0	3.0	6.5	5.5	12.0	10.0	16.5	13.5	18.5	15.0	20.0	16.5
5	3.0	2.0	---	---	13.0	9.5	17.5	14.0	19.0	15.5	19.5	18.0
6	3.0	3.0	---	---	16.0	11.0	19.5	16.5	19.5	17.0	20.0	17.5
7	3.5	3.0	---	---	15.5	10.5	17.5	16.0	19.5	16.0	20.0	17.5
8	3.5	3.0	---	---	13.5	9.5	19.0	15.5	20.0	17.5	17.5	17.0
9	3.5	3.5	---	---	14.5	11.5	18.0	16.0	18.5	16.0	17.0	16.5
10	3.5	3.5	---	---	15.5	11.5	16.5	13.5	18.5	15.0	18.5	16.0
11	3.5	3.5	---	---	15.5	14.0	17.5	13.5	18.0	15.0	18.0	17.0
12	3.5	3.5	---	---	14.5	13.5	17.0	14.0	19.5	16.0	18.0	16.5
13	3.5	3.5	---	---	15.0	12.0	17.5	15.0	21.0	17.5	16.5	16.0
14	3.5	3.5	---	---	15.0	12.0	18.5	14.5	21.0	18.0	15.5	15.5
15	3.5	3.5	---	---	12.0	9.5	18.5	15.5	20.5	18.0	15.5	15.5
16	4.5	4.0	---	---	12.5	10.5	18.5	15.0	19.5	18.0	15.5	14.5
17	6.5	4.0	---	---	13.0	12.5	19.5	16.0	19.5	17.0	15.5	14.5
18	5.5	5.0	---	---	13.0	11.5	19.5	17.0	19.0	17.0	15.0	14.0
19	5.0	5.0	---	---	13.5	11.0	19.5	17.0	18.0	16.5	14.0	13.5
20	4.5	4.5	---	---	12.5	11.5	19.0	17.0	18.0	15.0	14.0	13.5
21	4.5	4.5	11.0	7.5	13.0	12.0	18.0	15.5	19.0	16.0	13.5	13.5
22	4.5	4.5	12.0	8.5	14.0	10.0	16.5	15.0	18.5	17.0	14.0	12.5
23	5.0	5.0	12.5	9.0	13.5	11.0	18.5	14.5	17.5	16.0	14.0	12.5
24	5.0	5.0	13.0	9.5	14.0	11.5	21.0	17.5	18.5	16.0	14.0	13.0
25	5.0	4.0	12.0	9.5	14.0	12.0	20.0	17.5	19.5	18.5	13.5	12.5
26	4.5	4.5	13.5	9.5	15.5	13.5	21.0	18.5	20.5	19.0	14.0	12.5
27	4.5	4.5	14.0	11.5	16.0	13.0	21.0	18.5	19.5	19.0	14.0	12.5
28	5.0	4.5	14.0	12.5	15.5	12.5	20.0	16.0	19.0	18.5	13.0	11.5
29	5.0	4.5	14.5	12.5	16.5	13.5	18.0	17.0	19.5	18.0	13.0	12.0
30	5.5	5.0	14.5	13.0	16.5	13.5	18.0	14.5	19.0	18.0	12.0	12.0
31	---	---	14.5	13.0	---	---	18.0	15.5	19.0	17.5	---	---
10NTH	6.5	2.0			16.5	9.5	21.0	12.0	21.0	15.0	20.0	11.5

STREAMS TRIBUTARY TO LAKE MICHIGAN

89

04058000 MIDDLE BRANCH ESCANABA RIVER NEAR ISHPERING, MI

LOCATION.--Lat 46°23'40", long 87°45'30", in NW¼ SW¼ sec.12, T.46 N., R.28 W., Marquette County, Hydrologic Unit 04030110, at former gaging station on left bank 0.5 mi (0.8 km) downstream from County Highway 581, 6 mi (10 km) southwest of Ishpeming, and 10 mi (16 km) east of Republic.

DRAINAGE AREA.--128 mi² (332 km²).

PERIOD OF DAILY RECORD.--

WATER TEMPERATURES: August 1961 to September 1975, October 1976 to current year.

INSTRUMENTATION.--Temperature recorder since Aug. 24, 1961.

REMARKS.--Temperature recorder clock stopped Mar. 7-29 (range in temperature 0.0 to 1.0°C). Complete ice cover during winter period. Some regulation and diversion 6 mi (10 km) above station since December 1972.

EXTREMES FOR PERIOD OF DAILY RECORD.--

WATER TEMPERATURES: Maximum, 26.0°C July 19, 1977; minimum, 0.0°C on many days during winter periods.

EXTREMES FOR CURRENT YEAR.--

WATER TEMPERATURES: Maximum, 21.5°C July 19, 20; minimum, 0.0°C on many days during winter period.

TEMPERATURE (DEG. C) OF WATER, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DAY	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN
	OCTOBER		NOVEMBER		DECEMBER		JANUARY		FEBRUARY		MARCH	
1	11.5	11.0	7.0	7.0	.5	.5	.5	.5	.0	.0	.0	.0
2	11.0	10.0	7.0	7.0	.5	.5	.5	.5	.0	.0	.0	.0
3	10.0	9.0	7.5	7.0	.5	.5	.5	.5	.0	.0	.0	.0
4	10.0	8.0	7.5	6.5	.5	.5	.5	.5	.0	.0	.0	.0
5	9.0	8.5	6.5	5.5	.5	.5	.5	.5	.0	.0	.0	.0
6	9.0	8.0	5.5	5.0	.5	.5	.5	.5	.0	.0	.0	.0
7	8.0	6.5	6.0	5.5	.5	.5	.5	.5	.0	.0	---	---
8	6.5	6.5	7.0	6.0	.5	.5	.5	.5	.0	.0	---	---
9	6.5	6.5	7.5	7.0	.5	.5	.5	.5	.0	.0	---	---
10	6.5	6.0	7.0	6.0	.5	.5	.5	.5	.0	.0	---	---
11	6.5	6.0	6.0	4.0	.5	.5	.5	.5	.0	.0	---	---
12	6.5	6.5	4.0	2.5	.5	.5	.5	.5	.0	.0	---	---
13	6.5	5.5	2.5	2.5	.5	.5	.5	.5	.0	.0	---	---
14	5.5	5.5	3.0	2.5	.5	.5	.5	.5	.0	.0	---	---
15	5.5	5.5	3.0	3.0	.5	.5	.5	.5	.0	.0	---	---
16	5.5	5.5	3.0	3.0	.5	.5	.5	.5	.0	.0	---	---
17	5.5	5.5	3.0	3.0	.5	.5	.5	.5	.0	.0	---	---
18	6.5	5.5	3.0	3.0	.5	.5	.0	.0	.0	.0	---	---
19	7.0	6.5	3.0	2.5	.5	.5	.0	.0	.0	.0	---	---
20	7.0	6.5	2.5	2.5	.5	.5	.0	.0	.0	.0	---	---
21	7.5	7.0	2.5	1.5	.5	.5	.0	.0	.0	.0	---	---
22	7.5	6.5	1.5	1.5	.5	.5	.0	.0	.0	.0	---	---
23	6.5	6.0	1.5	1.5	.5	.5	.0	.0	.0	.0	---	---
24	7.5	6.5	1.5	1.0	.5	.5	.0	.0	.0	.0	---	---
25	9.0	7.5	1.0	1.0	.5	.5	.0	.0	.0	.0	---	---
26	9.0	8.5	1.0	.5	.5	.5	.0	.0	.0	.0	---	---
27	8.5	8.0	.5	.5	.5	.5	.0	.0	.0	.0	---	---
28	8.0	7.0	.5	.5	.5	.5	.0	.0	.0	.0	---	---
29	7.0	7.0	.5	.5	.5	.5	.0	.0	---	---	---	---
30	7.0	7.0	.5	.5	.5	.5	.0	.0	---	---	.5	.5
31	7.0	7.0	---	---	.5	.5	.0	.0	---	---	.5	.5
MONTH	11.5	5.5	7.5	.5	.5	.5	.5	.0	.0	.0		

STREAMS TRIBUTARY TO LAKE MICHIGAN  
04058000 MIDDLE BRANCH ESCANABA RIVER NEAR ISHPEMING, MI--CONTINUED

TEMPERATURE (DEG. C) OF WATER, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DAY	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN
	APRIL		MAY		JUNE		JULY		AUGUST		SEPTEMBER	
1	.5	.5	6.5	5.5	16.5	14.5	18.0	16.5	16.0	14.0	16.5	16.0
2	.5	.5	6.5	5.5	15.0	14.0	16.0	15.0	17.0	15.5	17.5	15.5
3	.5	.5	6.5	6.0	14.5	13.0	18.5	15.0	16.5	14.5	17.0	15.5
4	1.0	.5	6.5	6.0	14.0	13.0	19.0	16.5	16.5	13.5	17.5	15.5
5	2.0	1.0	7.0	6.5	14.0	12.0	19.5	17.0	17.5	14.5	17.5	17.0
6	2.0	1.0	8.5	7.0	16.5	13.5	20.5	19.0	18.5	16.0	18.0	16.5
7	1.5	.5	9.5	7.5	16.5	12.0	20.5	18.5	18.5	15.5	18.0	17.5
8	2.0	1.0	9.0	8.0	14.0	11.0	18.5	17.0	19.0	17.0	17.5	17.0
9	2.0	1.0	8.5	8.0	14.5	12.5	20.0	17.0	19.0	15.5	17.0	16.5
10	1.0	1.0	10.0	9.0	15.0	12.5	17.0	14.5	16.5	14.0	17.5	16.5
11	1.0	1.0	10.5	9.5	15.0	14.5	18.0	14.0	16.5	14.5	17.5	15.5
12	1.0	1.0	10.5	9.5	14.5	13.0	17.0	16.5	18.5	15.5	17.0	15.5
13	1.0	1.0	9.5	8.0	13.5	11.5	17.5	16.0	20.0	17.0	15.5	15.0
14	1.5	1.0	8.0	7.5	13.5	11.5	18.5	16.0	20.0	18.0	15.0	15.0
15	2.0	1.5	10.0	7.5	15.0	12.5	18.5	17.0	20.0	19.0	15.0	14.5
16	2.5	1.5	12.0	9.5	15.0	13.5	18.5	16.0	19.5	18.0	14.0	13.0
17	2.5	1.5	10.5	13.5	15.5	15.0	20.5	17.5	19.0	17.0	13.5	13.0
18	2.5	2.0	14.0	12.5	17.0	15.0	21.0	19.5	18.5	17.5	13.5	13.5
19	2.5	2.0	14.0	13.5	18.0	15.0	21.5	19.0	17.5	16.5	13.5	13.0
20	2.5	2.0	14.0	13.0	18.5	17.5	21.5	19.5	16.5	14.5	13.5	13.0
21	4.0	2.0	13.0	12.0	17.5	15.0	19.5	18.0	17.5	15.5	13.0	13.0
22	4.5	2.5	13.5	12.0	17.0	14.0	18.0	17.0	17.5	16.5	13.0	12.0
23	4.0	3.0	15.5	12.0	16.5	14.5	17.5	16.0	17.5	15.0	13.0	12.0
24	4.5	3.5	17.0	13.0	16.5	14.5	19.5	17.0	15.0	15.0	13.0	12.5
25	5.5	4.0	16.0	14.5	16.5	16.0	19.5	18.0	16.0	15.0	13.0	12.0
26	5.5	4.5	17.5	14.5	19.0	16.5	18.5	17.5	17.5	16.0	13.0	12.0
27	5.5	5.0	18.5	16.5	19.5	17.5	18.5	17.5	17.5	17.5	13.0	12.5
28	6.0	5.0	18.5	17.5	19.0	17.0	18.5	16.0	17.5	17.5	12.5	11.0
29	6.0	5.5	19.0	17.0	20.5	18.0	16.5	15.5	17.5	17.0	12.0	11.5
30	6.0	5.0	18.0	17.0	20.5	19.5	16.0	14.5	17.0	16.0	11.5	11.5
31	---	---	18.0	16.5	---	---	16.0	14.5	16.0	15.5	---	---
MONTH	6.0	.5	19.0	5.5	20.5	11.0	21.5	14.0	20.0	13.5	18.0	11.0



STREAMS TRIBUTARY TO LAKE MICHIGAN

91

04058100 MIDDLE BRANCH ESCANABA RIVER NEAR PRINCETON, MI

LOCATION.--Lat 46°19'02", long 87°30'07", in NW¼ sec.12, T.45 N., R.26 W., Marquette County, Hydrologic Unit 04030110, on right bank 400 ft (122 m) downstream from powerplant, 0.3 mi (0.5 km) upstream from Green Creek, and 2.2 mi (3.5 km) northwest of Princeton.

DRAINAGE AREA.--210 mi<sup>2</sup> (544 km<sup>2</sup>).

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--July 1961 to current year.

GAGE.--Water-stage recorder. Altitude of gage is 1,100 ft (335 m) from topographic map (nearest 20 ft).

REMARKS.--Water-discharge records good. Flow regulated by powerplant above station. Since December 1972, additional regulation 27 mi (43 km) above station (see station 04057814). Since January 1973, flow diverted to Green Creek 27 mi (43 km) above station (see station 04057813) by industry for iron ore processing and some returned via another Green Creek 0.3 mi (0.5 km) below this station.

AVERAGE DISCHARGE.--17 years, 218 ft<sup>3</sup>/s (6.174 m<sup>3</sup>/s), 14.10 in/yr, (358 mm/yr), adjusted for storage and diversion since December 1972.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 2,580 ft<sup>3</sup>/s (73.1 m<sup>3</sup>/s) May, 6, 1972, gage height, 7.85 ft (2.393 m); minimum recorded, 2.2 ft<sup>3</sup>/s (0.062 m<sup>3</sup>/s) Oct. 5, 1964; minimum daily, 4.1 ft<sup>3</sup>/s (0.12 m<sup>3</sup>/s) Feb. 4, 1967.

EXTREMES OUTSIDE PERIOD OF RECORD.--Flood of Apr. 25 and 26, 1960, reached a stage of 10.5 ft (3.20 m) from floodmark, discharge, 3,850 ft<sup>3</sup>/s (109 m<sup>3</sup>/s).

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 1,940 ft<sup>3</sup>/s (54.9 m<sup>3</sup>/s) Sept. 14, gage height, 7.00 ft (2.134 m); minimum, 5.8 ft<sup>3</sup>/s (0.16 m<sup>3</sup>/s) June 8, 29, Aug. 1, gage height, 0.74 ft (0.226 m); minimum daily, 82 ft<sup>3</sup>/s (2.32 m<sup>3</sup>/s) Feb. 11.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	187	152	181	140	108	99	113	904	253	90	125	569
2	186	152	162	140	105	93	113	837	248	90	93	439
3	185	153	140	116	110	93	115	727	256	90	93	399
4	163	282	140	97	115	93	115	637	254	90	93	391
5	138	308	116	99	115	95	119	568	251	88	93	188
6	139	303	89	99	118	95	301	520	229	91	93	95
7	139	230	90	99	115	95	304	489	187	91	93	147
8	140	185	90	99	112	95	183	458	139	91	93	202
9	153	181	90	101	112	94	187	462	154	91	93	202
10	358	208	90	101	97	93	192	473	154	91	93	197
11	374	263	98	103	82	93	348	492	155	91	93	454
12	376	182	123	105	84	92	386	508	161	91	93	1130
13	285	182	137	105	84	92	330	494	350	93	93	1520
14	306	182	135	105	84	92	240	575	313	93	93	1870
15	318	189	136	105	84	92	240	571	204	93	92	1650
16	316	202	137	108	84	91	242	531	204	93	94	1290
17	242	202	137	108	84	92	245	487	202	95	95	1020
18	188	192	137	108	84	92	369	435	202	97	99	802
19	187	174	137	108	85	92	427	395	202	97	101	646
20	188	175	135	108	87	91	485	383	203	258	121	552
21	208	251	135	108	101	91	493	378	204	262	306	483
22	235	249	135	108	110	92	479	279	204	87	213	428
23	233	178	136	108	110	93	512	230	203	118	227	322
24	233	180	137	105	109	93	568	229	202	325	293	322
25	231	210	138	104	110	94	636	227	201	226	259	286
26	200	227	139	105	106	93	705	194	171	151	357	264
27	160	212	141	105	104	93	781	169	126	271	418	324
28	141	200	142	105	104	93	850	170	88	264	587	245
29	147	184	148	110	---	93	906	172	84	199	661	179
30	148	182	145	110	---	94	919	176	90	199	732	352
31	151	---	142	111	---	102	---	324	---	197	696	---
TOTAL	6649	6170	4040	3333	2803	2895	11903	13494	5894	4303	6685	16966
MEAN	214	206	130	108	100	93.4	397	435	196	139	216	566
MAX	374	308	181	140	118	102	919	904	350	325	732	1870
MIN	138	152	89	97	82	91	113	169	84	87	92	95

CAL YR 1977 TOTAL 54513 MEAN 149 MAX 576 MIN 54 MEAN+ 178 CFSM+ 0.85 IN+ 11.51

WTR YR 1978 TOTAL 85135 MEAN 233 MAX 1870 MIN 82 MEAN+ 248 CFSM+ 1.18 IN+ 16.04

\*Adjusted for diversion and change in contents in Greenwood Reservoir.

## STREAMS TRIBUTARY TO LAKE MICHIGAN

04058100 MIDDLE BRANCH ESCANABA RIVER NEAR PRINCETON, MI--CONTINUED

## WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1963, 1965, 1967 to current year.

## WATER QUALITY DATA. WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DATE	TIME	STREAM- FLOW- INSTAN- TANEOUS (CFS)	SPE- CIFIC CON- DUCT- ANCE (MICRO- MHOS)	PH (UNITS)	TEMPER- ATURE, AIR (DEG C)	TEMPER- ATURE (DEG C)	COLOR (PLAT- INUM- COPALT UNITS)	TUR- BID- ITY (JTU)	HARD- NESS (MG/L AS CAC03)
OCT									
21...	1100	190	85	7.6	7.0	7.0	110	3	31
DEC									
05...	1100	140	85	7.6	-2.0	.5	55	1	38
29...	1130	148	94	7.5	-11.0	.5	90	3	40
FEB									
01...	1330	110	90	7.4	-12.0	.5	90	3	44
23...	1145	110	105	7.7	-5.0	.0	60	3	44
MAR									
22...	1130	93	100	7.1	5.0	.5	60	4	110
MAY									
02...	1145	843	60	6.9	10.0	6.0	80	4	26
16...	1140	530	65	7.5	20.5	10.5	70	3	26
JUN									
05...	1200	253	72	7.0	17.5	15.0	120	3	33
JUL									
11...	1130	91	92	7.5	20.0	20.0	45	1	43
AUG									
14...	1110	93	98	7.6	25.5	23.5	55	4	46
SEP									
14...	1345	1940	50	7.5	20.5	15.0	300	4	33

DATE	CALCIUM DIS- SOLVED (MG/L AS CA)	MAGNE- SIUM, DIS- SOLVED (MG/L AS MG)	NITRO- GEN, NO2+NO3 TOTAL (MG/L AS N)	IRON, TOTAL RECOV- ERABLE (UG/L AS FE)	IRON, SUS- PENDED RECOV- ERABLE (UG/L AS FE)	IRON, DIS- SOLVED (UG/L AS FE)	MANGA- NESE, TOTAL RECOV- ERABLE (UG/L AS MN)	MANGA- NESE, SUS- PENDED RECOV- ERABLE (UG/L AS MN)	MANGA- NESE, DIS- SOLVED (UG/L AS MN)
OCT									
21...	8.0	2.7	.07	1200	--	740	70	0	70
DEC									
05...	10	3.2	.16	820	--	830	140	0	140
29...	10	3.6	.17	1100	--	720	90	10	80
FEB									
01...	12	3.4	.18	1100	--	1000	100	10	90
23...	11	3.9	.19	1000	--	790	60	10	50
MAR									
22...	17	16	.22	1200	--	200	90	--	--
MAY									
02...	6.9	2.1	.25	1300	--	720	70	20	50
16...	6.7	2.2	.18	870	--	550	40	10	30
JUN									
05...	8.7	2.8	.14	1600	--	960	150	50	100
JUL									
11...	11	3.8	.09	1100	--	750	170	40	130
AUG									
14...	12	3.9	.04	1100	390	710	170	50	120
SEP									
14...	10	2.0	.09	2100	800	1300	130	40	90

## STREAMS TRIBUTARY TO LAKE MICHIGAN

93

04058120 GREEN CREEK NEAR PALMER, MI

LOCATION.--Lat 46°22'22", long 87°36'21", in NW¼ sec.19, T.46 N., R.26 W., Marquette County, Hydrologic Unit 04030110, at culvert on County Road 565, 4.5 mi (7.2 km) south of Palmer.

DRAINAGE AREA.--8.42 mi² (21.81 km²).

PERIOD OF RECORD.--Water years 1964-65, 1969 to current year.

REMARKS.--Since 1970, industrial diversion into headwaters from Schweitzer Reservoir (station 04058190), for iron ore processing.

## WATER QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DATE	TIME	STREAM- FLOW- INSTAN- TANEOUS (CFS)	SPE- CIFIC CON- DUCT- ANCE (MICRO- MHOS)	PH (UNITS)	TEMPER- ATURE, AIR (DEG C)	TEMPER- ATURE (DEG C)	COLOR (PLAT- INUM- CORALT UNITS)	TUR- BID- ITY (JTU)	HARD- NESS (MG/L AS CAC03)
OCT									
20...	1345	13	400	8.1	18.0	7.0	75	6	98
DEC									
05...	1200	15	420	8.0	-5	1.0	55	7	100
29...	1045	27	425	8.3	-15.0	.5	50	7	100
FEB									
09...	1100	19	444	8.1	-3.0	.0	50	10	100
23...	1100	16	450	8.1	-5.0	1.0	40	8	100
MAR									
22...	1400	15	440	7.8	6.0	.0	20	5	44
MAY									
02...	1410	8.7	270	6.9	12.5	10.0	50	9	79
16...	1330	5.7	290	7.9	24.0	10.0	60	3	79
JUN									
05...	1330	13	344	8.0	22.5	17.0	20	4	94
JUL									
11...	1245	32	408	7.7	23.0	20.5	20	2	100
AUG									
14...	1310	14	426	7.9	30.0	24.0	30	2	100
SEP									
14...	1315	47	342	7.2	14.5	15.0	50	3	87

DATE	CALCIUM DIS- SOLVED (MG/L AS CA)	MAGNE- SIUM, DIS- SOLVED (MG/L AS MG)	NITRO- GEN, NO2+NO3 TOTAL (MG/L AS N)	IRON, TOTAL RECOV- ERABLE (UG/L AS FE)	IRON, SUS- PENDE RECOV- ERABLE (UG/L AS FE)	IRON, DIS- SOLVED (UG/L AS FE)	MANGA- NESE, TOTAL RECOV- ERABLE (UG/L AS MN)	MANGA- NESE, SUS- PENDE RECOV. (UG/L AS MN)	MANGA- NESE, DIS- SOLVED (UG/L AS MN)
OCT									
20...	18	13	.00	630	--	140	140	90	50
DEC									
05...	18	14	.04	--	--	300	210	10	200
29...	16	15	.11	830	--	170	250	30	220
FEB									
09...	17	15	.51	1700	--	220	570	40	530
23...	16	15	.38	1000	--	160	400	10	390
MAR									
22...	11	3.9	.42	950	--	830	550	480	70
MAY									
02...	16	9.6	.16	2500	--	750	1300	100	1200
16...	16	9.5	.10	720	--	240	580	0	580
JUN									
05...	18	12	.01	450	--	80	340	230	110
JUL									
11...	16	15	.06	650	--	70	350	320	30
AUG									
14...	16	15	.08	250	220	30	130	90	40
SEP									
14...	15	12	.20	920	780	140	110	70	40

LOCATION.--Lat 46°20'02", long 87°31'58", in SW<sub>4</sub> SW<sub>4</sub> sec.35, T.46 N., R.26 W., Marquette County, Hydrologic Unit 04030110, on right bank 100 ft (30 m) downstream from bridge on State Highway 35, 3.0 mi (4.8 km) upstream from mouth, and 4.0 mi (6 km) northwest of Princeton.

DRAINAGE AREA.--13.8 mi<sup>2</sup> (35.7 km<sup>2</sup>).

## WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--Occasional low-flow measurements, water years 1961-65, 1971. October 1976 to current year.

GAGE.--Water-stage recorder. Datum of gage is 1,165.74 ft (355.318 m) National Geodetic Vertical Datum of 1929. Prior to Oct. 14, 1977, nonrecording gage at bridge 100 ft (30 m) upstream at datum 0.97 ft (0.296 m) higher.

REMARKS.--Water-discharge records fair. Regulation by tailings ponds in headwaters.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 166 ft<sup>3</sup>/s (4.70 m<sup>3</sup>/s) Sept. 12, 1978, gage height, 5.75 ft (1.753 m); minimum daily, 6.8 ft<sup>3</sup>/s (0.19 m<sup>3</sup>/s) Aug. 12, 26, 1977.

EXTREMES OUTSIDE PERIOD OF RECORD.--A discharge of 2.84 ft<sup>3</sup>/s (0.080 m<sup>3</sup>/s) was measured Oct. 1, 1963.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 166 ft<sup>3</sup>/s (4.70 m<sup>3</sup>/s) Sept. 12, gage height, 5.75 ft (1.753 m); minimum, 8.6 ft<sup>3</sup>/s (0.24 m<sup>3</sup>/s) July 17, gage height, 2.26 ft (0.689 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	26	21	19	28	23	18	20	28	25	17	28	39
2	23	21	20	28	22	18	21	25	24	17	29	37
3	22	27	21	27	22	18	21	24	23	16	31	36
4	21	31	20	27	22	17	22	23	23	14	29	34
5	21	25	19	26	22	17	23	21	23	14	28	33
6	20	23	19	26	21	17	24	19	22	14	28	32
7	19	24	20	26	21	17	25	18	23	13	27	31
8	30	23	21	26	21	17	25	19	26	14	23	31
9	35	23	23	26	21	17	26	21	24	12	22	31
10	34	23	24	25	21	17	27	18	23	19	22	31
11	33	23	26	25	20	17	29	18	25	34	22	73
12	34	21	27	25	20	17	32	22	43	35	22	134
13	31	20	29	25	20	17	30	23	33	33	22	74
14	28	19	30	25	20	17	28	39	28	30	22	65
15	25	18	31	24	20	17	28	31	28	14	22	64
16	24	20	32	24	20	17	30	24	30	10	32	55
17	23	19	33	24	19	17	32	20	29	8.9	26	49
18	26	19	34	23	19	17	33	19	31	10	25	45
19	25	18	34	23	19	17	36	19	29	13	26	44
20	24	20	34	23	19	17	33	18	27	30	23	42
21	23	29	33	22	19	17	31	17	27	26	21	39
22	23	25	33	22	19	17	32	16	25	26	19	37
23	22	20	33	22	19	17	33	17	24	30	28	35
24	22	20	32	22	19	17	36	18	23	26	38	33
25	21	20	32	22	18	18	38	19	22	36	32	32
26	21	20	32	23	18	18	40	21	21	41	30	31
27	21	17	31	24	18	18	42	21	20	38	33	36
28	20	18	31	24	18	19	39	28	21	28	53	34
29	20	18	30	24	---	19	37	25	20	27	50	35
30	19	18	30	24	---	19	32	24	18	27	46	39
31	19	---	29	23	---	19	---	27	---	28	42	---
TOTAL	755	643	862	758	560	541	905	682	760	700.9	901	1331
MEAN	24.4	21.4	27.8	24.5	20.0	17.5	30.2	22.0	25.3	22.6	29.1	44.4
MAX	35	31	34	28	23	19	42	39	43	41	53	134
MIN	19	17	19	22	18	17	20	16	18	8.9	19	31
CAL YR 1977	TOTAL	6603.2	MEAN	18.1	MAX	51	MIN	6.8				
WTR YR 1978	TOTAL	9398.9	MEAN	25.8	MAX	134	MIN	8.9				

## 95

WATER-QUALITY RECORDS

WATER TEMPERATURES: Maximum recorded, 23.5°C June 29; minimum, 0.0°C on many days during winter period.

DAY	ONCE DAILY	ONCE DAILY	MAX	MIN	MEAN	MAX	MIN	MEAN
	OCTOBER	NOVEMBER	DECEMBER			JANUARY		
1	11.5	9.0	---	---	---	.0	.0	.0
2	11.0	9.0	---	---	---	.0	.0	.0
3	11.0	8.0	---	---	---	.0	.0	.0
4	11.0	6.5	---	---	---	.0	.0	.0
5	11.0	5.5	---	---	---	.0	.0	.0
6	9.0	6.0	.0	.0	.0	.0	.0	.0
7	7.0	7.0	.0	.0	.0	.0	.0	.0
8	7.0	7.5	.0	.0	.0	.0	.0	.0
9	6.0	9.5	.0	.0	.0	.0	.0	.0
10	5.0	7.0	.0	.0	.0	.0	.0	.0
11	5.0	5.0	.0	.0	.0	.0	.0	.0
12	5.5	6.0	.0	.0	.0	.0	.0	.0
13	6.0	1.0	.0	.0	.0	.0	.0	.0
14	5.0	2.5	.0	.0	.0	.0	.0	.0
15	6.0	3.0	.0	.0	.0	.0	.0	.0
16	5.5	4.0	.0	.0	.0	.0	.0	.0
17	6.0	3.0	.0	.0	.0	.0	.0	.0
18	6.5	2.0	.0	.0	.0	.0	.0	.0
19	7.0	.0	.0	.0	.0	.0	.0	.0
20	9.0	---	.0	.0	.0	.0	.0	.0
21	8.5	.0	.0	.0	.0	.0	.0	.0
22	6.0	---	.0	.0	.0	.0	.0	.0
23	6.0	---	.0	.0	.0	.0	.0	.0
24	8.0	---	.0	.0	.0	.0	.0	.0
25	10.0	---	.0	.0	.0	.0	.0	.0
26	11.0	---	.0	.0	.0	.0	.0	.0
27	9.0	---	.0	.0	.0	.0	.0	.0
28	7.5	---	.0	.0	.0	.0	.0	.0
29	5.5	---	.0	.0	.0	.0	.0	.0
30	8.0	---	.0	.0	.0	.0	.0	.0
31	8.0	---	.0	.0	.0	.0	.0	.0
MONTH						.0	.0	.0



DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
	FEBRUARY			MARCH			APRIL			MAY		
1	.0	.0	.0	.0	.0	.0	1.5	.5	1.0	10.0	4.5	7.0
2	.0	.0	.0	.0	.0	.0	2.0	.0	1.0	10.5	5.5	8.0
3	.0	.0	.0	.0	.0	.0	1.5	.5	1.5	10.5	6.5	8.5
4	.0	.0	.0	.0	.0	.0	2.0	1.0	1.5	12.0	6.5	9.0
5	.0	.0	.0	.0	.0	.0	3.5	.5	1.5	12.0	7.0	9.5
6	.0	.0	.0	.0	.0	.0	1.5	.5	1.0	13.0	7.5	10.0
7	.0	.0	.0	.0	.0	.0	2.5	.5	1.5	13.5	8.0	10.5
8	.0	.0	.0	.0	.0	.0	1.0	.0	.5	11.5	9.0	10.0
9	.0	.0	.0	.0	.0	.0	.0	.0	.0	9.0	8.0	8.5
10	.0	.0	.0	.0	.0	.0	.5	.0	.0	13.5	7.0	10.5
11	.0	.0	.0	.0	.0	.0	2.0	.0	1.0	14.5	10.0	12.5
12	.0	.0	.0	.0	.0	.0	2.5	.5	1.5	13.0	8.5	10.5
13	.0	.0	.0	.0	.0	.0	2.0	.5	1.5	8.5	6.0	7.0
14	.0	.0	.0	.0	.0	.0	3.0	.5	1.5	6.5	5.5	6.0
15	.0	.0	.0	.0	.0	.0	4.0	.0	2.0	12.5	6.5	9.5
16	.0	.0	.0	.0	.0	.0	6.0	.0	3.0	16.5	10.0	13.5
17	.0	.0	.0	.0	.0	.0	6.5	.5	3.5	18.5	12.0	15.0
18	.0	.0	.0	.0	.0	.0	4.0	2.0	3.5	20.0	12.5	16.5
19	.0	.0	.0	.0	.0	.0	3.0	1.5	2.5	20.0	14.5	17.5
20	.0	.0	.0	.0	.0	.0	2.5	.5	1.5	16.5	11.5	14.5
21	.0	.0	.0	.0	.0	.0	6.5	.5	3.0	15.5	9.0	12.5
22	.0	.0	.0	.0	.0	.0	7.5	1.5	4.5	17.0	11.0	14.0
23	.0	.0	.0	.0	.0	.0	5.0	2.5	4.0	18.0	12.0	15.0
24	.0	.0	.0	.0	.0	.0	8.5	3.5	5.5	20.0	13.0	16.5
25	.0	.0	.0	.0	.0	.0	9.0	3.5	6.5	18.5	15.0	17.0
26	.0	.0	.0	.0	.0	.0	9.0	4.5	6.5	22.0	16.0	19.0
27	.0	.0	.0	.0	.0	.0	10.0	5.0	7.5	23.0	19.5	21.0
28	.0	.0	.0	.0	.0	.0	12.0	6.5	9.5	21.0	19.5	20.0
29	---	---	---	.0	.0	.0	10.0	7.5	9.0	22.0	18.0	20.0
30	---	---	---	.5	.0	.0	9.5	5.0	7.0	20.5	18.5	19.5
31	---	---	---	1.5	.5	1.0	---	---	---	19.5	16.5	18.0
MONTH	.0	.0	.0	1.5	.0	.0	12.0	.0	3.0	23.0	4.5	13.0

[illegible]

STREAMS TRIBUTARY TO LAKE MICHIGAN

97

04058190 SCHWEITZER RESERVOIR NEAR PALMER, MI

LOCATION.--Lat 46°25'00", long 87°38'48", in SE¼ NW¼ sec.2, T.46 N., R.27 W., Marquette County, Hydrologic Unit 04030110, on left bank 120 ft (36 m) upstream from dam on Schweitzer Creek, and 3.0 mi (4.8 km) southwest of Palmer.

DRAINAGE AREA.--23.1 mi<sup>2</sup> (59.8 km<sup>2</sup>).

PERIOD OF RECORD.--January 1963 to current year (monthend contents only).

GAGE.--Water-stage recorder. Datum of gage is 1,300.00 ft (396.240 m) Cleveland-Cliffs Iron Co. datum; gage readings have been reduced to elevations NGVD. Prior to Oct. 25, 1967, nonrecording gage at same site and datum.

REMARKS.--Reservoir is formed by an earthfill dam with fixed crest concrete spillway completed in 1963. Usable capacity of reservoir is 5,300 acre-ft (6.53 hm<sup>3</sup>) at spillway elevation 1,338.00 ft (407.822 m). The dam includes a discharge pipe equipped with valve to control release flow to Schweitzer Creek (station 04058200). An average of 2.2 ft<sup>3</sup>/s (0.062 m<sup>3</sup>/s) was diverted from the headwaters of basin by the city of Ishpeming for municipal supply and the effluent discharged to the Carp River basin. An average of 18 ft<sup>3</sup>/s (0.51 m<sup>3</sup>/s) was diverted from reservoir for iron ore processing and some returned to the Middle Branch Escanaba River basin by Green Creek. Since January 1973, controlled diversion from Greenwood Reservoir (station 04057811) via Greenwood Diversion (station 04057813) into Schweitzer Reservoir. Controlled inflow averaged 11.5 ft<sup>3</sup>/s (0.33 m<sup>3</sup>/s) for the year.

EXTREMES FOR PERIOD OF RECORD.--Maximum contents recorded, 5,900 acre-ft (7.27 hm<sup>3</sup>) May 31, 1970, elevation, 1,339.5 ft (408.28 m); minimum recorded since first filling, 2,920 acre-ft (3.60 hm<sup>3</sup>) Apr. 10, 1974, elevation, 1,329.7 ft (405.29 m).

EXTREMES FOR CURRENT YEAR.--Maximum contents, 5,740 acre-ft (7.08 hm<sup>3</sup>) Sept. 11, 12, elevation, 1,339.1 ft (408.16 m); minimum, 4,470 acre-ft (5.51 hm<sup>3</sup>) Mar. 7-10, elevation, 1,335.4 ft (407.03 m).

MONTHEND ELEVATION, IN FEET NGVD, AND CONTENTS AT 2400, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

Date	Elevation (feet)	Contents (acre-feet)	Change in contents (acre-feet) (equivalent in ft <sup>3</sup> /s)	
Sept. 30	1338.1	5340	--	--
Oct. 31	1338.1	5340	0	0
Nov. 30	1338.1	5340	0	0
Dec. 31	1337.9	5260	-80	-1.3
CAL YR 1977	--	--	+910	+1.3
Jan. 31	1336.4	4770	-490	-8.0
Feb. 28	1335.7	4560	-210	-3.8
Mar. 31	1336.3	4740	+180	+2.9
Apr. 30	1338.4	5460	+720	+12.1
May 31	1338.1	5340	-120	-2.0
June 30	1337.6	5160	-180	-3.0
July 31	1337.6	5160	0	0
Aug. 31	1338.1	5340	+180	+2.9
Sept. 30	1338.1	5340	0	0
WTR YR 1978	--	--	0	0

LOCATION.--Lat 46°24'40", long 87°37'27", in SW¼ sec.1, T.46 N., R.27 W., Marquette County, Hydrologic Unit 04030110, on right bank 10 ft (3 m) upstream from highway bridge, 2.5 mi (4.0 km) southwest of Palmer.

PERIOD OF RECORD.--October 1960 to current year.

REMARKS.--Records good. Since August 1962, flow completely regulated by Schweitzer Reservoir (station 04058190), 1.0 mi (1.6 km) above station. An average of 2.2 ft<sup>3</sup>/s (0.062 m<sup>3</sup>/s) was diverted from headwaters of basin by the city of Ishpeming for municipal supply and the effluent discharged to the Carp River basin. An average of 18 ft<sup>3</sup>/s (0.51 m<sup>3</sup>/s) was diverted from Schweitzer Reservoir by industry for iron ore processing and some returned to the Middle Branch Escanaba River via Green Creek. Diversion into Schweitzer Reservoir from Greenwood Reservoir via Greenwood Diversion (station 04057813). Several observations of water temperature were made during the year.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 635 ft<sup>3</sup>/s (18.0 m<sup>3</sup>/s) Sept. 11, gage height, 5.90 ft (1.798 m); minimum, 3.1 ft<sup>3</sup>/s (0.088 m<sup>3</sup>/s) Mar. 8, gage height, 2.77 ft (0.844 m); minimum daily, 4.9 ft<sup>3</sup>/s (0.14 m<sup>3</sup>/s) Nov. 25, 26.

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	22	17	16	9.8	5.9	5.6	6.2	65	18	6.2	6.1	18
2	18	19	16	9.5	5.8	5.6	6.2	53	14	6.2	6.4	14
3	14	27	13	9.0	5.8	5.6	5.9	41	10	6.1	6.1	12
4	12	40	12	8.6	5.8	5.6	6.7	33	9.7	6.1	6.0	9.6
5	12	37	12	8.3	5.9	5.4	6.9	35	9.4	6.1	5.9	8.9
6	10	30	12	8.3	5.8	5.4	6.9	32	8.8	6.1	5.9	8.9
7	9.6	27	13	8.2	5.9	5.4	7.5	29	9.1	6.4	5.9	7.9
8	33	25	14	8.2	5.9	5.2	7.2	32	10	6.2	5.9	7.4
9	77	25	15	7.9	5.9	5.5	15	39	10	6.1	6.0	7.2
10	65	26	15	8.2	5.9	5.6	45	39	9.1	6.1	6.1	8.3
11	58	28	15	8.0	5.9	5.7	53	37	10	6.1	6.1	296
12	59	22	15	8.0	5.9	5.6	57	36	31	6.0	6.1	442
13	50	18	14	8.1	5.8	5.6	58	38	30	6.3	6.1	165
14	40	18	14	8.0	5.9	5.6	53	52	19	6.2	6.1	107
15	33	18	13	8.0	5.9	5.6	46	66	13	6.1	7.1	103
16	27	20	13	8.0	5.8	5.6	47	57	13	6.0	6.8	73
17	25	21	14	8.0	5.8	5.6	57	44	13	5.9	6.3	54
18	26	22	17	8.0	5.7	5.6	73	35	16	6.2	7.1	44
19	25	19	20	8.0	5.6	5.6	89	28	15	7.4	6.5	39
20	23	24	19	8.0	5.6	5.6	92	24	12	6.8	6.3	36
21	22	39	22	8.0	5.6	5.6	73	21	9.7	6.2	6.1	30
22	19	25	20	8.0	5.6	5.3	66	18	7.4	6.5	6.1	24
23	17	12	17	8.0	5.5	5.6	70	14	6.4	6.3	23	20
24	17	5.9	16	8.0	5.6	5.6	72	11	6.4	6.1	90	19
25	17	4.9	14	8.0	5.6	5.4	85	9.4	6.4	10	60	16
26	17	4.9	13	8.0	5.6	5.6	107	9.4	6.3	19	31	15
27	17	5.0	12	8.0	5.6	5.6	109	10	6.2	19	31	21
28	16	14	12	8.0	5.6	5.9	107	23	6.2	13	97	23
29	14	16	12	8.0	---	5.9	105	32	6.1	8.7	80	28
30	14	14	11	7.2	---	5.9	87	33	6.1	6.1	44	37
31	14	---	10	5.9	---	6.2	---	26	---	6.2	27	---
TOTAL	822.6	623.7	451	251.2	161.2	173.6	1619.5	1021.8	347.3	231.7	620.0	1694.2
MEAN	26.5	20.8	14.5	8.10	5.76	5.60	54.0	33.0	11.6	7.47	20.0	56.5
MAX	77	40	22	9.8	5.9	6.2	109	66	31	19	97	442
MIN	9.6	4.9	10	5.9	5.5	5.2	5.9	9.4	6.1	5.9	5.9	7.2
CAL YR 1977	TOTAL	3602.7	MEAN	9.87	MAX	77	MIN	3.6				
WTR YR 1978	TOTAL	8017.8	MEAN	22.0	MAX	442	MIN	4.9				

## STREAMS TRIBUTARY TO LAKE MICHIGAN

99

04058250 WARNER CREEK TRIBUTARY NEAR PALMER, MI

LOCATION.--Lat 46°25'20", long 87°36'09", in NW¼ SE¼ sec.31, T.47 N., R.26 W., Marquette County, Hydrologic Unit 04030110, at double culvert on County Road 565, 0.3 mi (0.5 km) upstream from mouth, and 0.8 mi (1.3 km) south of Palmer.

DRAINAGE AREA.--4.05 mi<sup>2</sup> (10.49 km<sup>2</sup>).

PERIOD OF RECORD.--Water years 1972 to current year.

## WATER QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DATE	TIME	STREAM- FLOW, INSTAN- TANEOUS (CFS)	SPF- CIFIC CON- DUCT- ANCE (MICRO- MHOS)	PH (UNITS)	TEMPER- ATURE, AIR (DEG C)	TEMPER- ATURE (DEG C)	COLOR (PLAT- INUM- CORAL UNITS)	TUR- BID- ITY (JTU)	HARD- NESS (MG/L AS CAC03)
OCT									
20...	1530	2.5	245	7.5	18.0	7.0	65	2	90
DEC									
05...	1400	3.0	340	7.6	-5.5	.0	50	3	140
29...	0930	3.2	322	7.8	-15.0	.0	21	3	140
FEB									
09...	1145	1.4	378	8.2	-3.0	.0	40	5	150
23...	1015	1.8	380	7.6	-5.0	.0	40	5	150
MAR									
22...	1500	2.8	367	7.2	6.5	.0	30	4	140
MAY									
02...	1515	7.4	299	7.2	15.0	9.0	50	4	110
16...	1450	4.9	205	7.4	26.0	16.0	70	4	65
JUN									
05...	1500	3.0	362	7.6	23.0	15.0	55	4	130
JUL									
11...	1500	1.7	421	7.7	26.0	19.0	20	1	170
AUG									
14...	1500	1.1	425	7.4	31.0	24.0	35	3	190
SEP									
14...	1045	4.3	216	7.1	14.5	12.5	150	5	90

DATE	CALCIUM DIS- SOLVED (MG/L AS CA)	MAGNE- SIUM, DIS- SOLVED (MG/L AS MG)	NITRO- GEN, NO2+NO3 TOTAL (MG/L AS N)	IRON, TOTAL RECOV- ERABLE (UG/L AS FE)	IRON, SUS- PENDED RECOV- ERABLE (UG/L AS FE)	IRON, DIS- SOLVED (UG/L AS FE)	MANGA- NESE, TOTAL RECOV- ERABLE (UG/L AS MN)	MANGA- NESE, SUS- PENDED RECOV. (UG/L AS MN)	MANGA- NESE, DIS- SOLVED (UG/L AS MN)
OCT									
20...	22	8.4	.07	590	--	420	80	0	80
DEC									
05...	33	14	.28	510	--	200	110	10	100
29...	33	14	.28	360	--	110	60	10	50
FEB									
09...	36	15	.30	630	--	120	170	0	170
23...	35	15	.30	840	--	270	230	10	220
MAR									
22...	34	14	.35	520	--	100	--	--	360
MAY									
02...	26	9.9	.21	780	--	150	200	0	200
16...	16	6.1	.11	1700	--	480	160	100	60
JUN									
05...	30	13	.06	940	--	350	180	70	110
JUL									
11...	39	17	.03	430	--	140	220	10	210
AUG									
14...	46	18	.00	740	540	200	410	70	340
SEP									
14...	22	8.4	.06	1000	390	610	--	--	80

## STREAMS TRIBUTARY TO LAKE MICHIGAN

04058300 WARNER CREEK NEAR PALMER, MI

LOCATION.--Lat 46°24'09", long 87°32'39", in NW¼ sec.10, T.46 N., R.26 W., Marquette County, Hydrologic Unit 04030110, on left bank 10 ft (3 m) upstream from bridge on county highway, 0.1 mi (0.2 km) upstream from confluence with Schweitzer Creek, and 3.5 mi (5.6 km) southeast of Palmer.

DRAINAGE AREA.--14.2 mi<sup>2</sup> (36.8 km<sup>2</sup>).

PERIOD OF RECORD.--July 1961 to September 1968, October 1972 to September 1978 (discontinued as a continuous-record station; converted to low-flow partial-record station). Occasional low-flow measurements, water years 1969-70, and annual maximum, water years 1970-72.

REVISED RECORDS.--WDR MI-77-1: 1976.

GAGE.--Water-stage recorder. Altitude of gage is 1,190 ft (363 m) from topographic map (nearest 10 ft). Prior to Aug. 22, 1961, non-recording gage at present site and datum.

REMARKS.--Records poor. Headwaters are affected by waste effluent and mine pumpage. Several observations of water temperature were made during the year.

AVERAGE DISCHARGE.--7 years, (water years 1962-68), 15.8 ft<sup>3</sup>/s (0.447 m<sup>3</sup>/s), 15.11 in/yr (384 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 600 ft<sup>3</sup>/s (17.0 m<sup>3</sup>/s) May 31, 1970, gage height, 8.95 ft (2.728 m), backwater from Schweitzer Creek; minimum discharge, 0.5 ft<sup>3</sup>/s (0.014 m<sup>3</sup>/s) Sept. 10, 1961, gage height, 0.79 ft (0.241 m).

EXTREMES FOR CURRENT YEAR.--Maximum daily discharge, 300 ft<sup>3</sup>/s (8.50 m<sup>3</sup>/s) Sept. 12; minimum daily, 4.6 ft<sup>3</sup>/s (0.130 m<sup>3</sup>/s) July 12.

DISCHARGE. IN CUBIC FEET PER SECOND. WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	10	11	13	11	9.5	7.5	15	46	12	5.7	12	17
2	8.3	12	13	11	9.5	7.0	16	40	11	6.3	12	12
3	6.7	15	13	11	9.0	7.0	17	36	11	5.6	15	11
4	5.1	19	11	11	9.0	7.0	20	32	10	5.3	14	11
5	4.9	16	11	10	9.0	7.0	23	26	11	8.5	14	9.7
6	5.2	14	10	10	9.0	7.0	25	24	11	12	18	9.7
7	5.2	13	11	10	9.0	7.0	28	20	10	6.1	20	9.1
8	15	11	12	10	9.0	7.0	31	22	16	9.1	26	9.1
9	37	11	12	10	9.0	7.0	34	22	13	6.3	28	9.1
10	32	12	12	10	9.0	7.0	38	20	11	6.1	28	8.2
11	28	15	12	10	9.0	7.0	42	22	11	5.2	28	100
12	25	12	12	10	8.5	7.5	44	22	22	4.6	31	300
13	22	9.4	12	10	8.5	7.5	42	30	24	6.3	32	150
14	19	9.3	11	10	8.5	7.5	38	42	20	5.9	33	120
15	16	10	11	10	8.5	7.5	42	40	16	6.3	37	95
16	14	10	10	10	8.0	7.5	46	34	13	6.1	55	75
17	12	11	11	10	8.0	8.0	52	26	13	7.3	45	55
18	14	11	14	10	8.0	8.0	62	22	14	11	40	45
19	13	10	17	10	8.0	8.0	68	18	12	18	35	40
20	11	15	16	10	8.0	8.0	62	16	11	51	23	28
21	10	24	18	10	8.0	8.0	58	15	10	28	22	26
22	9.4	20	15	10	8.0	8.5	62	15	8.8	21	18	23
23	8.2	17	12	10	8.0	8.5	68	14	7.9	16	22	22
24	8.4	16	11	10	8.0	9.0	72	13	8.0	12	28	20
25	9.2	15	12	9.5	8.0	9.0	78	11	8.4	9.5	26	18
26	9.8	15	11	9.5	8.0	10	82	11	7.6	8.5	20	16
27	13	13	11	9.5	8.0	10	80	11	6.6	7.5	26	18
28	14	13	11	9.5	7.5	11	76	14	6.4	16	42	21
29	10	13	11	9.5	---	12	68	14	6.3	16	34	22
30	7.9	12	11	9.5	---	13	58	14	6.3	45	28	25
31	7.7	---	11	9.5	---	14	---	12	---	26	20	---
TOTAL	411.0	404.7	378	310.5	237.5	260.0	1447	704	348.3	398.2	832	1324.9
MEAN	13.3	13.5	12.2	10.0	8.48	8.39	48.2	22.7	11.6	12.8	26.8	44.2
MAX	37	24	18	11	9.5	14	82	46	24	51	55	300
MTN	4.9	9.3	10	9.5	7.5	7.0	15	11	6.3	4.6	12	8.2
CAL YR 1977	TOTAL	8301.9	MEAN	22.7	MAX	153	MIN	7.1				
WTR YR 1978	TOTAL	7056.1	MEAN	19.3	MAX	300	MIN	4.6				



## STREAMS TRIBUTARY TO LAKE MICHIGAN

101

04058400 GOOSE LAKE OUTLET NEAR SANDS STATION, MI

LOCATION.--Lat 46°23'36", long 87°29'40", in SE $\frac{1}{4}$  SE $\frac{1}{4}$  sec.12, T.46 N., R.26 W., Marquette County, Hydrologic Unit 04030110, on left bank 0.8 mi (1.3 km) upstream from mouth, and 3 mi (5 km) west of Sands Station.

DRAINAGE AREA.--37.5 mi<sup>2</sup> (97.1 km<sup>2</sup>).

## WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--October 1965 to current year.

GAGE.--Water-stage recorder. Altitude of gage is 1,160 ft (354 m) from topographic map (nearest 10 ft).

REMARKS.--Water-discharge records good except those for period of no gage-height record, Apr. 26 to June 2, which are fair. Some mine-water pumped into basin at headwaters.

AVERAGE DISCHARGE.--10 years (water years 1966-75), 32.8 ft<sup>3</sup>/s (0.929 m<sup>3</sup>/s), 11.88 in/yr (302 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 458 ft<sup>3</sup>/s (13.0 m<sup>3</sup>/s) May 3, 1970, gage height, 5.89 ft (1.795 m); minimum, 3.7 ft<sup>3</sup>/s (0.105 m<sup>3</sup>/s) Oct. 10, 1976, Jan. 22, Feb. 14 and part or all of each day Feb. 16-23, Feb. 26 to Mar. 8, 1977, gage height, 1.35 ft (0.411 m).

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 232 ft<sup>3</sup>/s (6.57 m<sup>3</sup>/s) Apr. 28, gage height, 4.26 ft (1.298 m), from peak stage indicator; minimum, 7.3 ft<sup>3</sup>/s (0.207 m<sup>3</sup>/s) Aug. 15, gage height, 1.48 ft (0.451 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	20	20	23	17	13	11	19	160	46	16	16	29
2	18	20	23	17	13	11	19	130	42	16	16	25
3	17	26	23	17	13	11	21	115	38	15	14	25
4	16	28	23	17	13	11	24	105	36	14	14	24
5	16	26	22	17	13	11	30	96	33	13	13	23
6	15	27	22	17	13	11	39	90	31	13	12	22
7	14	27	20	17	12	10	45	84	33	14	11	21
8	25	26	20	17	12	10	52	80	33	15	11	20
9	32	25	21	16	12	11	59	84	31	13	9.9	20
10	40	25	19	15	13	11	76	82	30	13	9.5	20
11	47	27	20	15	13	11	81	78	34	12	8.8	90
12	50	26	21	16	13	11	84	88	54	11	8.4	172
13	49	26	22	16	13	11	95	84	38	12	8.1	141
14	48	26	22	16	13	11	93	140	36	11	7.7	149
15	46	26	22	16	13	12	94	160	33	11	8.1	141
16	42	28	22	16	12	12	95	130	34	10	12	121
17	39	29	23	15	12	12	100	115	32	10	9.8	104
18	42	29	24	15	12	12	114	94	36	11	11	90
19	37	28	22	15	12	12	139	78	33	14	12	79
20	34	34	24	15	12	12	165	68	32	23	12	71
21	32	39	22	15	11	12	171	60	31	20	11	63
22	28	39	24	15	11	12	156	56	28	22	10	56
23	26	44	24	14	11	13	158	50	26	23	21	50
24	25	40	23	15	11	12	167	47	24	20	21	46
25	24	31	21	15	11	12	192	43	23	20	22	42
26	22	35	20	13	11	13	210	41	22	20	22	39
27	22	30	21	12	11	13	220	40	21	18	28	44
28	21	27	20	12	11	14	225	45	19	17	44	38
29	20	25	19	12	---	15	220	52	18	19	40	43
30	19	24	18	13	---	16	200	54	17	17	37	43
31	19	---	17	13	---	17	---	52	---	17	32	---
TOTAL	905	863	667	471	340	373	3363	2601	944	480	512.3	1961
MEAN	29.2	28.8	21.5	15.2	12.1	12.0	112	83.9	31.5	15.5	16.5	62.0
MAX	50	44	24	17	13	17	225	160	54	23	44	172
MIN	14	20	17	12	11	10	19	40	17	10	7.7	20

CAL YR 1977 TOTAL 8112.7 MEAN 22.2 MAX 161 MIN 3.7  
WTR YR 1978 TOTAL 13380.3 MEAN 36.7 MAX 225 MIN 7.7

STREAMS TRIBUTARY TO LAKE MICHIGAN  
04058400 GOOSE LAKE OUTLET NEAR SANDS STATION, MI--CONTINUED

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water year 1972 to current year.

PERIOD OF DAILY RECORD.--

WATER TEMPERATURES: November 1976 to current year.

INSTRUMENTATION.--Water-quality monitor since November 1976.

REMARKS.--Intermittent ice cover during winter period.

EXTREMES FOR PERIOD OF DAILY RECORD.--

WATER TEMPERATURES: Maximum, 25.0°C July 19, 1977; minimum, 0.0°C on many days during winter periods.

EXTREMES FOR CURRENT YEAR.--

WATER TEMPERATURES: Maximum, 21.5°C May 27; minimum, 0.0°C on many days during winter period.

TEMPERATURE (DEG. C) OF WATER, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
	OCTOBER			NOVEMBER			DECEMBER			JANUARY		
1	10.0	9.0	9.5	8.5	7.0	7.5	.0	.0	.0	.0	.0	.0
2	9.5	8.0	8.5	8.0	7.5	8.0	.0	.0	.0	.0	.0	.0
3	9.5	7.0	8.5	8.5	7.5	8.0	.0	.0	.0	.0	.0	.0
4	9.5	6.5	8.0	7.0	4.5	6.0	.0	.0	.0	.0	.0	.0
5	9.5	8.5	9.0	4.5	3.0	4.0	.0	.0	.0	.0	.0	.0
6	8.5	7.0	7.5	4.5	3.0	3.5	.0	.0	.0	.0	.0	.0
7	7.0	5.0	6.0	6.5	4.5	5.5	.5	.0	.0	.0	.0	.0
8	6.5	6.0	6.5	8.0	6.5	7.0	.0	.0	.0	.0	.0	.0
9	6.5	6.0	6.5	9.0	8.0	8.5	1.0	.0	.0	.0	.0	.0
10	7.0	5.0	6.0	8.5	5.0	7.0	.0	.0	.0	.0	.0	.0
11	7.5	6.5	7.0	4.5	.0	1.5	.0	.0	.0	.0	.0	.0
12	6.5	5.0	5.5	.0	.0	.0	.0	.0	.0	.0	.0	.0
13	5.5	3.5	4.5	.5	.0	.0	.0	.0	.0	.0	.0	.0
14	6.5	5.0	5.5	1.0	.0	.5	.0	.0	.0	.0	.0	.0
15	6.5	5.5	6.0	1.5	.0	.5	.0	.0	.0	.0	.0	.0
16	6.0	4.5	5.0	2.0	1.5	1.5	.0	.0	.0	.0	.0	.0
17	6.0	3.5	5.0	1.5	1.5	1.5	.5	.0	.5	.0	.0	.0
18	6.5	5.5	6.0	1.5	1.0	1.5	.0	.0	.0	.0	.0	.0
19	7.0	6.0	6.5	1.5	.5	1.0	.5	.0	.0	.0	.0	.0
20	7.0	4.5	6.0	1.5	.5	1.0	2.0	.0	.5	.0	.0	.0
21	8.0	6.5	7.0	1.5	.0	.0	2.0	.0	1.0	.0	.0	.0
22	6.5	5.0	6.0	.0	.0	.0	.5	.0	.0	.5	.0	.0
23	5.5	4.0	5.0	.0	.0	.0	.5	.0	.0	.5	.0	.0
24	7.0	4.5	5.5	.0	.0	.0	.0	.0	.0	.5	.0	.5
25	9.0	7.0	8.0	.0	.0	.0	.0	.0	.0	.5	.0	.5
26	9.0	8.0	8.5	.0	.0	.0	.0	.0	.0	.5	.0	.0
27	8.5	7.0	8.0	.0	.0	.0	.5	.0	.0	.5	.0	.0
28	7.0	5.5	6.5	.0	.0	.0	.0	.0	.0	.5	.0	.0
29	6.5	4.5	5.5	.0	.0	.0	.0	.0	.0	.5	.0	.0
30	7.0	6.0	6.5	.0	.0	.0	.0	.0	.0	.5	.0	.0
31	7.5	6.0	6.5	---	---	---	.0	.0	.0	.5	.0	.5
MONTH	10.0	3.5	6.5	9.0	.0	2.5	2.0	.0	.0	.5	.0	.0

## 04058400 GOOSE LAKE OUTLET NEAR SANDS STATION, MI--CONTINUED

TEMPERATURE (DEG. C) OF WATER, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
FEBRUARY				MARCH			APRIL			MAY		
1	.5	.0	.0	1.0	.5	.5	1.5	1.0	1.5	7.5	3.5	6.0
2	.5	.0	.0	1.0	.5	.5	2.0	.0	1.0	9.0	5.0	7.0
3	.5	.0	.0	1.0	.5	.5	2.0	.5	1.0	9.0	6.0	7.5
4	.5	.0	.0	1.0	.5	.5	2.0	1.0	1.5	10.0	6.0	8.0
5	.5	.0	.0	.5	.5	.5	2.5	.0	1.5	10.5	7.0	9.0
6	.5	.0	.0	1.0	.5	.5	1.5	.5	1.0	11.5	7.5	9.5
7	.5	.0	.5	1.0	.0	.5	3.5	.5	1.5	12.5	8.0	10.5
8	1.5	.5	.5	1.0	.0	.5	2.0	.0	1.0	12.0	9.5	10.5
9	1.0	.5	.5	1.0	.5	.5	.5	.0	.0	9.0	7.5	8.0
10	1.0	.5	.5	1.5	.5	.5	.5	.0	.5	13.0	7.0	10.0
11	1.0	.5	.5	2.0	.0	1.0	1.5	.0	.5	14.0	11.5	13.0
12	.5	.5	.5	2.0	.0	1.0	1.0	.0	.5	13.5	9.0	11.0
13	1.5	.5	.5	1.5	.5	1.0	1.0	.0	.5	8.5	6.0	7.0
14	1.5	.5	1.0	1.0	.5	.5	1.5	.0	.5	6.5	5.5	6.0
15	1.0	.5	.5	2.0	.0	1.0	1.5	.5	.5	12.5	6.5	9.5
16	1.5	.5	1.0	1.5	.0	.5	2.5	.5	1.0	17.0	11.5	14.0
17	1.5	.5	1.0	1.0	.0	.5	4.0	.5	2.0	18.0	13.5	15.5
18	1.0	.5	.5	.5	.0	.0	2.5	.5	2.0	19.5	14.0	17.0
19	.5	.5	.5	1.5	.0	.5	2.0	.5	1.0	19.0	15.5	17.5
20	.5	.5	.5	1.0	.0	.5	.5	.5	.5	17.5	11.5	15.0
21	.5	.5	.5	1.0	.0	.5	3.0	.5	1.5	14.5	9.5	12.0
22	1.0	.5	.5	2.0	.0	1.0	5.0	.5	3.0	16.0	12.0	14.0
23	.5	.5	.5	2.0	.0	1.0	4.5	2.0	3.5	17.0	12.5	15.0
24	1.0	.5	.5	2.0	.0	1.0	7.0	2.5	5.0	17.5	13.5	15.5
25	1.0	.5	.5	1.5	.0	.5	7.0	2.5	5.0	17.0	15.0	16.0
26	1.0	.5	.5	2.0	.0	1.0	6.5	3.0	5.0	20.5	15.5	18.0
27	1.5	.5	.5	3.0	.0	1.5	8.0	3.5	6.0	21.5	18.5	20.0
28	1.5	.5	.5	3.0	.5	2.0	9.5	5.0	7.5	20.0	18.0	19.0
29	---	---	---	3.5	.0	2.0	9.0	5.0	6.5	20.0	17.0	18.0
30	---	---	---	2.0	.5	1.5	7.0	3.0	5.5	19.5	17.0	18.5
31	---	---	---	2.0	1.0	1.5	---	---	---	18.0	15.0	16.5
MONTH	1.5	.0	.5	3.5	.0	1.0	9.5	.0	2.5	21.5	3.5	12.5

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
	JUNE			JULY			AUGUST			SEPTEMBER		
1	15.0	13.0	14.0	17.0	15.0	15.5	16.5	12.5	14.5	18.0	14.5	16.0
2	15.0	13.0	14.0	16.5	13.5	15.0	17.5	14.5	15.5	19.0	16.5	17.5
3	14.0	12.0	13.0	18.5	14.0	16.0	16.0	13.0	14.5	18.0	16.0	17.0
4	12.5	12.0	12.0	18.0	14.0	16.0	16.5	12.5	14.5	17.5	14.0	16.0
5	14.0	9.5	12.0	19.0	14.5	16.5	17.5	13.0	15.5	16.5	16.0	16.5
6	18.0	12.5	15.0	19.0	16.5	17.5	17.5	14.5	16.0	18.5	16.0	17.0
7	16.5	10.5	13.5	18.0	16.0	17.0	18.0	13.5	16.0	17.5	16.0	16.5
8	13.5	8.5	11.0	18.5	15.0	17.0	18.0	15.5	17.0	16.0	14.5	15.0
9	15.0	11.5	13.0	17.0	15.0	16.0	17.0	14.0	15.5	14.5	14.5	14.5
10	15.5	11.0	13.0	16.0	12.5	14.5	16.0	12.5	14.5	17.0	14.5	15.5
11	16.0	14.5	15.0	16.5	11.5	14.0	15.5	13.0	14.0	16.5	15.5	16.0
12	14.5	11.5	13.0	16.0	13.0	15.0	16.5	13.5	15.0	15.5	12.5	14.0
13	13.5	9.0	11.5	17.0	14.0	15.5	18.0	15.0	16.5	12.5	12.0	12.0
14	13.5	10.0	12.0	17.5	13.0	15.5	19.0	15.5	17.0	13.5	12.0	12.5
15	16.0	12.0	14.0	17.0	14.0	15.5	18.5	16.5	17.5	13.0	12.5	13.0
16	17.0	14.0	15.5	17.0	12.5	15.0	18.0	16.5	17.5	13.0	11.0	12.0
17	17.5	15.0	16.0	18.0	14.0	16.0	18.0	15.0	16.5	13.0	12.0	12.5
18	18.0	15.0	16.5	17.5	16.0	17.0	16.5	15.5	16.0	12.5	12.0	12.5
19	18.5	14.0	16.0	19.0	15.5	17.0	16.5	15.0	15.5	13.0	12.0	12.5
20	17.5	16.0	16.5	17.5	16.5	17.0	16.5	12.5	14.5	13.5	12.5	13.0
21	16.0	14.0	15.0	16.5	14.5	16.0	17.5	13.5	15.5	12.5	11.5	12.0
22	17.0	12.0	14.0	15.5	14.0	14.5	17.0	15.0	16.0	11.5	9.0	10.5
23	15.0	12.5	14.0	17.5	13.5	15.0	16.0	14.5	15.0	12.5	10.0	11.0
24	17.0	13.0	15.0	19.0	14.5	16.5	15.5	14.5	15.0	13.0	11.0	12.0
25	17.0	14.5	16.0	19.5	16.5	18.0	15.5	14.0	14.5	12.0	10.5	11.0
26	19.0	16.0	17.0	20.0	17.5	18.5	17.0	15.0	16.0	12.5	10.0	11.0
27	19.5	16.0	17.5	18.0	16.5	17.0	16.5	16.0	16.5	12.0	10.5	11.5
28	20.0	15.5	17.5	16.0	13.5	15.0	18.0	16.5	17.0	10.0	8.5	9.5
29	21.0	17.0	19.0	15.0	13.5	14.5	18.5	16.0	17.0	10.0	9.5	9.5
30	19.0	15.5	17.5	15.5	11.5	13.5	17.0	15.0	16.0	10.5	9.5	10.0
31	---	---	---	15.0	12.5	14.0	15.5	13.0	14.5	---	---	---
MONTH	21.0	8.5	14.5	20.0	11.5	16.0	19.0	12.5	15.5	19.0	8.5	13.5

## STREAMS TRIBUTARY TO LAKE MICHIGAN

04058500 EAST BRANCH ESCANABA RIVER AT GWINN, MI

LOCATION.--Lat 46°17'10", long 87°26'00", in NE¼ sec.21, T.45 N., R.25 W., Marquette County, Hydrologic Unit 04030110, on right bank in county park at Gwin, 1.1 mi (1.8 km) upstream from mouth.

DRAINAGE AREA.--124 mi<sup>2</sup> (321 km<sup>2</sup>).

## WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--October 1954 to current year.

REVISED RECORDS.--WSP 1911: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 1,079.2 ft (328.94 m) National Geodetic Vertical Datum of 1929.

REMARKS.--Water-discharge records good except those for the winter period, which are fair. Since August 1962, some regulation by Schweitzer Reservoir (station 04058190) about 16 mi (26 km) above station. An average of 2.2 ft<sup>3</sup>/s (0.062 m<sup>3</sup>/s) was diverted from headwaters of basin by the city of Ishpeming for municipal supply and the effluent discharged to the Carp River Basin. An average of 18 ft<sup>3</sup>/s (0.51 m<sup>3</sup>/s) was diverted from Schweitzer Reservoir by industry for iron ore processing and some returned to the Middle Branch Escanaba River via Green Creek. Diversion into Schweitzer Reservoir from Greenwood Reservoir via Greenwood Diversion (station 04057813).

AVERAGE DISCHARGE.--23 years, (water years 1955-77), 111 ft<sup>3</sup>/s (3.144 m<sup>3</sup>/s), 12.16 in/yr (309 mm/yr), adjusted for storage and diversion.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 2,390 ft<sup>3</sup>/s (67.7 m<sup>3</sup>/s) June 1, 1970, gage height, 14.97 ft (4.563 m); minimum, 19 ft<sup>3</sup>/s (0.54 m<sup>3</sup>/s) July 30, Oct. 11, 1963; minimum gage height, 6.46 ft (1.969 m) Sept. 14, 1976.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 1,200 ft<sup>3</sup>/s (34.0 m<sup>3</sup>/s) Sept. 12, gage height, 12.34 ft (3.761 m); minimum, 34 ft<sup>3</sup>/s (0.96 m<sup>3</sup>/s) Aug. 15, gage height, 6.74 ft (2.054 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	115	87	98	72	60	45	80	394	123	49	69	113
2	104	95	102	73	59	45	88	333	109	49	59	94
3	94	119	96	72	58	45	92	298	100	47	60	83
4	87	189	92	70	57	45	96	274	93	44	54	77
5	76	168	85	67	58	44	125	254	95	43	49	70
6	73	144	85	65	58	44	152	239	89	50	46	67
7	70	138	83	68	58	43	167	218	86	51	43	64
8	103	132	84	68	57	43	189	211	113	62	41	61
9	242	127	85	62	56	43	200	227	103	53	39	59
10	257	128	85	64	55	44	230	219	93	46	38	60
11	236	134	85	64	54	45	266	207	92	44	38	399
12	236	133	85	64	53	46	279	235	210	41	36	1130
13	213	118	86	65	52	47	304	223	200	41	36	920
14	180	111	85	65	52	47	285	404	151	43	35	521
15	158	111	88	64	52	48	257	429	142	44	35	473
16	144	124	99	63	51	47	274	352	117	42	58	344
17	130	138	103	62	50	47	305	288	111	40	60	299
18	134	134	105	61	50	47	363	239	121	40	51	240
19	135	124	106	61	50	47	410	202	117	49	61	207
20	124	127	106	59	50	46	470	176	102	147	56	193
21	115	228	105	59	49	45	439	157	93	120	49	174
22	107	214	105	58	48	46	398	147	83	90	44	160
23	99	159	105	58	48	47	414	135	74	102	83	138
24	95	136	100	58	48	50	439	123	68	84	179	125
25	94	125	96	58	48	53	502	114	66	73	196	116
26	94	115	92	58	48	55	546	109	64	111	151	108
27	93	105	88	58	47	58	560	104	60	130	123	127
28	94	98	84	58	46	61	573	126	56	98	264	132
29	90	99	80	58	---	64	570	146	53	85	296	136
30	84	98	77	58	---	70	491	145	50	73	209	168
31	80	---	73	58	---	74	---	139	---	88	144	---
TOTAL	3956	3958	2848	1948	1472	1531	9564	6867	3034	2079	2702	6798
MEAN	128	132	91.9	62.8	52.6	49.4	319	222	101	67.1	87.2	227
MAX	257	228	106	73	60	74	573	429	210	147	296	1130
MIN	70	87	73	58	46	43	80	104	50	40	35	59
CAL YR 1977	TOTAL	32837	MEAN	90.0	MAX	510	MIN	23				
WTR YR 1978	TOTAL	46757	MEAN	128	MAX	1130	MIN	35				

## STREAMS TRIBUTARY TO LAKE MICHIGAN

105

04058500 EAST BRANCH ESCANABA RIVER AT GWINN, MI--CONTINUED

## WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1955 to current year.

## WATER QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DATE	TIME	STREAM- FLOW, INSTAN- TANEOUS (CFS)	SPE- CIFIC CON- DUCT- ANCE (MICRO- MHOS)	PH (UNITS)	TEMPER- ATURE, AIR (DEG C)	TEMPER- ATURE (DEG C)	COLOR (PLAT- INUM- CORAL UNITS)	TUR- BID- ITY (JTU)	HARD- NESS (MG/L AS CAC03)
OCT									
21...	1200	116	170	7.6	8.0	6.0	65	2	71
DEC									
05...	1000	85	180	7.2	-2.0	.0	40	1	70
29...	1230	82	170	7.6	-10.0	.0	55	2	73
FEB									
01...	1030	60	175	7.5	-13.0	.0	55	2	86
23...	1330	48	180	7.5	1.5	.0	40	4	75
MAR									
22...	1300	46	160	7.4	6.0	.0	40	3	73
MAY									
02...	0945	336	103	7.1	11.0	6.0	50	2	41
16...	1015	354	110	7.8	16.0	11.0	80	2	44
JUN									
05...	1100	95	157	7.4	16.0	11.5	63	3	66
JUL									
11...	1015	44	160	7.6	18.0	14.5	45	1	71
AUG									
14...	0930	36	137	7.7	23.0	19.0	30	3	70
SEP									
14...	1445	510	123	7.4	21.0	14.0	150	4	56

DATE	CALCIUM DIS- SOLVED (MG/L AS CA)	MAGNE- SIUM, DIS- SOLVED (MG/L AS MG)	NITRO- GEN, NO2+NO3 TOTAL (MG/L AS N)	IRON, TOTAL RECOV- ERABLE (UG/L AS FE)	IRON, SUS- PENDED RECOV- ERABLE (UG/L AS FE)	IRON, DIS- SOLVED (UG/L AS FE)	MANGA- NESE, TOTAL RECOV- ERABLE (UG/L AS MN)	MANGA- NESE, SUS- PENDED RECOV. (UG/L AS MN)	MANGA- NESE, DIS- SOLVED (UG/L AS MN)
OCT									
21...	20	5.2	.09	560	--	330	30	0	30
DEC									
05...	19	5.4	.22	1100	--	420	60	0	60
29...	20	5.5	.22	1200	--	400	70	20	50
FEB									
01...	25	5.8	.31	--	--	420	50	0	50
23...	20	6.0	.28	670	--	380	50	20	30
MAR									
22...	20	5.6	.31	630	--	380	30	0	30
MAY									
02...	11	3.2	.13	580	--	270	30	10	20
16...	12	3.4	.10	1100	--	350	50	30	20
JUN									
05...	18	5.1	.12	1200	--	590	170	110	60
JUL									
11...	19	5.6	.12	700	--	420	50	10	40
AUG									
14...	20	4.9	.03	1300	880	420	50	10	40
SEP									
14...	15	4.4	.18	770	400	370	50	20	30



## STREAMS TRIBUTARY TO LAKE MICHIGAN

04059000 ESCANABA RIVER AT CORNELL, MI  
(National stream-quality accounting network station)

LOCATION.--Lat 45°54'31", long 87°12'49", in NW¼ sec.32, T.41 N., R.23 W., Delta County, Hydrologic Unit 04030110, on right bank 50 ft (15 m) downstream from bridge on County Road 519, 0.4 mi (0.6 km) downstream from Bobs Creek, 0.7 mi (1.1 km) northeast of Cornell, and 16 mi (26 km) upstream from mouth.

DRAINAGE AREA.--870 mi<sup>2</sup> (2,253 km<sup>2</sup>).

## WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--August 1903 to December 1912, January 1913 to November 1915 (gage heights only), October 1950 to current year. Monthly discharge only for some periods, published in WSP 1307. Published as "near Escanaba" 1903-15.

REVISED RECORDS.--WSP 1387: 1904.

GAGE.--Water-stage recorder. Datum of gage is 749.26 ft (228.374 m) National Geodetic Vertical Datum of 1929 (levels by Michigan Department of Natural Resources). August 1903 to November 1915, nonrecording gage at site 10 mi (16 km) downstream at different datum.

REMARKS.--Water-discharge records good except those for the winter period and period of no gage-height record, July 19 to Sept. 13, which are fair. Since 1950, diurnal fluctuation and occasional slight regulation caused by Boney Falls powerplant, 7 mi (11 km) upstream. Since August 1962, some regulation by Schweitzer Reservoir, about 50 mi (80 km) upstream (station 04058190). Since December 1972, some regulation by Greenwood Reservoir about 60 mi (97 km) upstream (station 04057811).

AVERAGE DISCHARGE.--37 years, (water years 1904-12, 1951-78), 888 ft<sup>3</sup>/s (25.15 m<sup>3</sup>/s), 13.86 in/yr (352 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 10,500 ft<sup>3</sup>/s (297 m<sup>3</sup>/s) May 7, 1960, gage height, 4.90 ft (1.494 m); maximum gage height, 6.40 ft (1.951 m) Apr. 9, 1971, backwater from ice; minimum discharge observed, 90 ft<sup>3</sup>/s (2.55 m<sup>3</sup>/s) July 5, 1910, gage height, 1.5 ft (0.46 m), site and datum then in use, but may have been less during extended periods of no gage-height record during winter periods of 1903-12, or periods of ice effect in 1959.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 6,990 ft<sup>3</sup>/s (198 m<sup>3</sup>/s) Sept. 14, gage height, 4.23 ft (1.289 m); maximum gage height, 4.59 ft (1.399 m) Apr. 8, backwater from ice; minimum discharge recorded, 239 ft<sup>3</sup>/s (6.77 m<sup>3</sup>/s) July 14, gage height, 1.39 ft (0.424 m), but may have been less during period of no gage-height record July 19 to Sept. 13.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1030	580	780	510	450	360	620	2940	1060	356	610	1440
2	907	761	680	500	440	350	650	2590	810	350	540	1340
3	818	1520	600	480	420	340	720	2270	780	367	580	1240
4	750	2200	580	480	420	330	820	2100	761	332	580	1040
5	693	2110	630	480	420	320	1000	1880	716	338	510	940
6	600	1810	580	480	430	320	1500	1710	711	330	450	740
7	594	1790	540	480	430	320	2250	1620	636	434	390	540
8	795	1540	510	480	430	320	2000	1570	641	525	380	740
9	1300	1470	480	480	440	330	1900	1640	601	584	410	640
10	1520	1520	480	470	430	330	1900	1710	605	400	390	540
11	1780	1470	480	470	410	330	2100	1670	604	366	380	1040
12	1730	1340	500	470	400	350	2400	1640	1290	453	390	2040
13	1610	1140	580	470	400	350	2200	1740	1780	389	350	4140
14	1370	1040	660	470	400	350	2100	2730	1860	308	380	5760
15	1230	1040	700	460	390	350	1960	3190	1460	390	440	6070
16	1130	1040	710	460	380	340	2060	2900	1070	414	540	4380
17	1030	1090	710	450	380	330	2320	2500	1010	466	700	3340
18	899	1020	760	450	380	330	2630	2030	884	331	460	2560
19	830	937	800	450	370	330	3040	1750	863	940	620	2320
20	790	943	830	450	360	330	3270	1510	758	1040	510	1990
21	760	1410	840	450	360	340	3040	1360	739	1290	640	1790
22	717	1600	850	450	360	350	2910	1220	590	840	700	1540
23	733	1300	850	450	360	360	2950	954	613	940	1040	1390
24	677	1090	700	450	360	370	3090	916	571	1340	1540	1110
25	705	1020	640	400	360	380	3300	827	533	1140	1840	1150
26	676	953	610	320	360	380	3580	784	533	680	2040	947
27	610	921	600	400	360	420	3580	719	510	790	2240	1310
28	579	850	580	450	360	470	3580	789	414	1190	2440	1280
29	557	700	570	460	---	520	3550	991	379	840	2540	1150
30	578	800	550	470	---	560	3280	980	373	590	2140	1420
31	556	---	530	460	---	600	---	930	---	590	1640	---
TOTAL	28554	37005	19910	14200	11060	11460	70300	52160	24155	19343	28410	56207
MEAN	921	1234	642	458	395	370	2343	1683	805	624	916	1874
MAX	1780	2200	850	510	450	600	3580	3190	1860	1340	2540	6070
MIN	556	580	480	320	360	320	620	719	373	308	350	540
CFSM	1.06	1.42	.74	.53	.45	.43	2.69	1.93	.93	.72	1.05	2.15
IN.	1.22	1.58	.85	.61	.47	.49	3.01	2.23	1.03	.83	1.21	2.40
CAL YR 1977	TOTAL	260187	MEAN	713	MAX	3800	MIN	140	CFSM	.82	IN	11.13
WTR YR 1978	TOTAL	372764	MEAN	1021	MAX	6070	MIN	308	CFSM	1.17	IN	15.94

## 04059000 ESCANABA RIVER AT CORNELL, MI--CONTINUED

## WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1969-73, 1975 to current year.

PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE: February 1975 to current year.

WATER TEMPERATURES: February 1975 to current year.

INSTRUMENTATION.--Water-quality monitor since October 1975.

REMARKS.--Interruptions in the record were due to malfunctions of the instrument. Monthly samples are collected as a cross-section sample in the reach of stream from the County Road 519 bridge to a point 200 ft (61 m) downstream. Complete ice cover during winter period.

EXTREMES FOR PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE (water years 1975-76, 1978): Maximum daily, 360 micromhos Sept. 10, 1975; minimum daily, 115 micromhos Apr. 24, 25, 1975, Sept. 13, 1978.

WATER TEMPERATURES: Maximum daily, 35.0°C July 31, 1975; minimum, 0.0°C on many days during winter periods.

EXTREMES FOR CURRENT YEAR.--

SPECIFIC CONDUCTANCE: Maximum, 273 micromhos Sept. 11; minimum observed, 115 micromhos Sept. 13.

WATER TEMPERATURES: Maximum, 29.0°C Aug. 13; minimum, 0.0°C on many days during winter period.

## WATER QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DATE	TIME	STREAM- FLOW, INSTAN- TANEOUS (CFS)	SPF- CIFIC CON- DUCT- ANCE (MICRO- MHOS)	PH (UNITS)	TEMPER- ATURE (DEG C)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION)	COLI- FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML)	STREP- TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML)	HARD- NESS (MG/L AS CAC03)	HARD- NESS, NONCAR- BONATE (MG/L CAC03)
OCT											
06...	1130	628	156	7.3	8.5	11.9	102	K3	17	81	7
NOV											
04...	1130	2330	165	7.4	7.5	11.2	93	K120	K210	90	17
DEC											
05...	1215	E700	182	7.2	.0	16.1	113	K11	K4	100	26
JAN											
13...	1400	450	227	7.9	.0	11.5	80	K13	K8	110	4
FEB											
09...	1400	514	210	7.8	.0	11.6	81	14	K9	100	13
MAR											
08...	1300	322	245	7.4	.0	12.5	87	29	--	98	1
APR											
13...	1400	2330	139	7.6	.5	13.4	96	30	14	70	9
MAY											
18...	1400	1980	140	7.5	15.5	9.8	100	K4	K2	65	13
JUN											
13...	1200	1660	158	8.0	13.5	10.2	99	155	132	80	13
JUL											
12...	1230	328	200	8.3	19.5	9.9	119	--	--	100	10
AUG											
15...	1130	290	205	8.4	21.5	9.2	108	K1	13	150	18
SEP											
13...	1215	4390	115	7.1	14.0	9.5	94	K620	K1000	57	13

DATE	CALCIUM DIS- SOLVED (MG/L AS CA)	MAGNE- SIUM, DIS- SOLVED (MG/L AS MG)	SODIUM, DIS- SOLVED (MG/L AS NA)	SODIUM AD- SORP- TION RATIO	SODIUM PERCENT	POTAS- SIUM, DIS- SOLVED (MG/L AS K)	BICAR- BONATE (MG/L AS HC03)	CAR- BONATE (MG/L AS C03)	ALKA- LINITY (MG/L AS CAC03)	CARBON DIOXIDE DIS- SOLVED (MG/L AS C02)	SULFATE DIS- SOLVED (MG/L AS S04)
OCT											
06...	19	8.1	2.3	.1	6	1.0	90	0	74	7.2	16
NOV											
04...	22	8.6	1.8	.1	4	1.1	90	0	74	5.7	15
DEC											
05...	23	9.5	3.0	.1	6	1.0	94	0	77	9.5	17
JAN											
13...	26	10	4.3	.2	8	1.1	124	0	100	2.5	14
FEB											
09...	24	10	5.4	.2	10	1.2	108	0	89	2.7	15
MAR											
08...	23	9.9	5.7	.3	11	1.3	118	0	97	7.5	14
APR											
13...	17	6.6	2.8	.1	8	1.0	74	0	61	3.0	13
MAY											
18...	16	6.2	1.6	.1	5	.9	64	0	53	3.2	13
JUN											
13...	20	7.3	2.2	.1	6	.7	82	0	67	1.3	9.7
JUL											
12...	25	10	3.4	.1	7	1.0	114	0	94	.9	8.6
AUG											
15...	35	14	1.1	.0	2	1.1	114	4	100	1.0	8.0
SEP											
13...	14	5.4	2.3	.1	8	.9	54	0	44	6.9	7.5

K--RESULTS BASED ON COLONY COUNT OUTSIDE THE ACCEPTABLE RANGE (NON-IDEAL COLONY COUNT)

E--ESTIMATED VALUE

STREAMS TRIBUTARY TO LAKE MICHIGAN  
04059000 ESCANABA RIVER AT CORNELL, MI--CONTINUED

WATER-QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978--CONTINUED

DATE	CHLORIDE, DIS-SOLVED (MG/L AS CL)	FLUORIDE, DIS-SOLVED (MG/L AS F)	SILICA, DIS-SOLVED (MG/L AS SI02)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L)	SOLIDS, SUM OF CONSTI- TUENTS, DIS-SOLVED (MG/L)	SOLIDS, DIS-SOLVED (TONS PER DAY)	NITRO- GEN, NO2+NO3 TOTAL (MG/L AS N)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N)	NITRO- GEN, ORGANIC TOTAL (MG/L AS N)	NITRO- GEN,AM- MONIA + ORGANIC TOTAL (MG/L AS N)
OCT 06...	3.6	.1	8.3	131	104	222	.11	.05	--	--
NOV 04...	2.4	.1	6.3	139	102	874	.18	.06	--	--
DEC 05...	3.4	.1	8.5	139	112	--	.25	.09	--	--
JAN 13...	3.6	.1	9.1	136	130	165	.31	.03	--	--
FEB 09...	3.4	.1	9.8	128	122	178	.23	.03	.26	.29
MAR 08...	3.9	.1	9.9	148	126	129	.28	.00	.51	.51
APR 13...	2.5	.1	6.9	110	87	692	.41	.01	.58	.59
MAY 18...	2.1	.1	3.9	103	75	551	.10	.02	.76	.78
JUN 13...	2.2	.1	5.5	127	88	569	.12	.01	.73	.74
JUL 12...	4.0	.1	5.9	139	114	123	.05	.00	.44	.44
AUG 15...	4.0	.1	7.1	136	131	106	.13	.01	.92	.93
SEP 13...	3.1	.1	7.0	113	67	1340	.11	.01	.87	.88

DATE	NITRO- GEN,NH4 + ORG. SUSP. TOTAL (MG/L AS N)	NITRO- GEN,AM- MONIA + ORGANIC DIS. (MG/L AS N)	NITRO- GEN, TOTAL (MG/L AS N)	NITRO- GEN, TOTAL (MG/L AS NO3)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, DIS-SOLVED (MG/L AS P)	CARBON, ORGANIC TOTAL (MG/L AS C)	SEDI- MENT, SUS- PENDED (MG/L)	SEDI- MENT CHARGE, SUS- PENDED (T/DAY)	SED. SUSP. DIS- SIEVE DIAM. % FINER THAN .062 MM
OCT 06...	--	.80	--	--	.01	.03	--	2	3.4	100
NOV 04...	--	1.3	--	--	.02	.01	9.3	5	31	100
DEC 05...	--	.73	--	--	.02	.02	11	1	--	100
JAN 13...	--	.44	--	--	.02	.02	--	--	--	--
FEB 09...	.00	.33	.52	2.3	.01	.01	5.2	1	1.4	100
MAR 08...	.18	.33	.79	3.5	.01	.01	6.7	1	.87	100
APR 13...	.13	.46	1.0	4.4	.01	.00	--	5	31	100
MAY 18...	.25	.53	.88	3.9	.04	.03	8.5	4	21	100
JUN 13...	.18	.56	.86	3.8	.01	.01	7.9	2	9.0	100
JUL 12...	.03	.41	.49	2.2	.01	.00	--	5	4.4	100
AUG 15...	.57	.36	1.1	4.7	.03	.01	9.2	4	3.1	100
SEP 13...	.00	--	.99	4.4	.02	.02	21	10	119	100

DATE	TIME	ARSENIC TOTAL (UG/L AS AS)	ARSENIC DIS- SOLVED (UG/L AS AS)	BARIUM, TOTAL RECOV- ERABLE (UG/L AS BA)	BARIUM, DIS- SOLVED (UG/L AS BA)	CADMIUM TOTAL RECOV- ERABLE (UG/L AS CD)	CADMIUM DIS- SOLVED (UG/L AS CD)	CHROMIUM, TOTAL RECOV- ERABLE (UG/L AS CR)	CHROMIUM, DIS- SOLVED (UG/L AS CR)	COBALT, TOTAL RECOV- ERABLE (UG/L AS CO)
OCT 06...	1130	0	0	0	0	0	0	10	7	0
JAN 13...	1400	0	0	0	0	0	0	20	0	0
APR 13...	1400	1	1	0	0	2	1	<10	2	0
JUL 12...	1230	1	0	0	0	5	3	10	0	0

## STREAMS TRIBUTARY TO LAKE MICHIGAN

109

04059000 ESCANABA RIVER AT CORNELL, MI--CONTINUED

WATER-QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978--CONTINUED

DATE	COBALT, DIS- SOLVED (UG/L AS CO)	COPPER, TOTAL RECOV- ERABLE (UG/L AS CU)	COPPER, DIS- SOLVED (UG/L AS CU)	IRON, TOTAL RECOV- ERABLE (UG/L AS FE)	IRON, DIS- SOLVED (UG/L AS FE)	LEAD, TOTAL RECOV- ERABLE (UG/L AS PB)	LEAD, DIS- SOLVED (UG/L AS PB)	MANGA- NESE, TOTAL RECOV- ERABLE (UG/L AS MN)	MANGA- NESE, DIS- SOLVED (UG/L AS MN)	MERCURY TOTAL RECOV- ERABLE (UG/L AS HG)
OCT 06...	0	13	12	1300	700	15	11	40	20	<.5
JAN 13...	0	5	2	880	380	--	5	50	10	<.5
APR 13...	0	8	3	740	300	19	4	50	20	<.5
JUL 12...	0	6	2	590	210	0	0	70	30	<.5

DATE	MERCURY DIS- SOLVED (UG/L AS HG)	SELF- NIUM, TOTAL (UG/L AS SE)	SELE- NIUM, DIS- SOLVED (UG/L AS SE)	SILVER, TOTAL RECOV- ERABLE (UG/L AS AG)	SILVER, DIS- SOLVED (UG/L AS AG)	ZINC, TOTAL RECOV- ERABLE (UG/L AS ZN)	ZINC, DIS- SOLVED (UG/L AS ZN)	CARBON, ORGANIC DIS- SOLVED (MG/L AS C)	CARBON, ORGANIC SUS- PENDED TOTAL (MG/L AS C)
OCT 06...	<.5	0	0	0	0	20	20	--	1.5
JAN 13...	<.5	0	0	0	0	20	20	9.0	--
APR 13...	<.5	0	0	0	0	20	10	24	.7
JUL 12...	<.5	0	0	0	0	0	0	6.2	.4

QUALITATIVE AND ASSOCIATED QUANTITATIVE ANALYSES OF BIOLOGICAL DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
PERI-PHYTON

DATE	TIME	LENGTH OF EXPO- SURE (DAYS)	PERI- PHYTON BIOMASS WEIGHT G/SQ M	PERI- PHYTON BIOMASS TOTAL DRY WEIGHT G/SQ M	CHLOR-A PERI- PHYTON CHROMO- GRAPHIC FLUOROM (MG/M2)	CHLOR-B PERI- PHYTON CHROMO- GRAPHIC FLUOROM (MG/M2)
NOV 04...	1130	29	.315	.394	.052	.002
FEB 09...	1400	27	.000	.000	.030	.000
MAY 18...	1400	35	14.7	19.4	4.11	.000

## STREAMS TRIBUTARY TO LAKE MICHIGAN

04059000 ESCANABA RIVER AT CORNELL, MI--CONTINUED

SPECIFIC CONDUCTANCE (MICROMHOS/CM AT 25 DEG. C), WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
	OCTOBER			NOVEMBER			DECEMBER			JANUARY		
1	225	219	223	261	245	251	---	---	---	224	218	220
2	224	220	222	267	251	259	---	---	---	226	219	223
3	223	217	221	263	229	247	---	---	---	226	219	223
4	225	217	221	243	203	217	---	---	---	226	219	222
5	226	218	222	206	195	202	251	249	250	226	218	222
6	222	218	221	204	199	201	252	245	249	221	213	219
7	222	215	218	216	203	211	248	236	240	219	188	202
8	247	220	237	222	207	214	239	235	236	226	191	211
9	244	230	237	220	208	213	242	236	239	227	223	225
10	242	221	232	217	210	214	253	241	246	228	225	227
11	222	216	218	---	---	---	258	243	253	229	226	227
12	226	212	220	---	---	---	256	244	250	230	225	227
13	227	209	220	---	---	---	254	239	246	231	225	228
14	219	206	211	---	---	---	239	232	235	229	223	226
15	211	206	208	---	---	---	236	231	234	229	225	227
16	211	204	208	---	---	---	238	168	216	229	223	226
17	209	202	205	---	---	---	208	190	198	229	223	225
18	216	203	210	---	---	---	201	189	195	229	223	226
19	222	214	217	---	---	---	200	185	190	232	223	227
20	223	214	219	---	---	---	187	178	184	231	223	227
21	229	221	225	---	---	---	209	185	194	229	222	225
22	236	224	231	---	---	---	252	214	234	230	222	226
23	236	226	232	---	---	---	245	222	233	227	221	225
24	235	226	230	---	---	---	239	228	234	229	222	226
25	240	219	231	---	---	---	247	239	243	226	219	223
26	230	217	223	---	---	---	245	231	239	238	219	228
27	228	221	224	---	---	---	239	224	230	245	230	241
28	236	222	229	---	---	---	228	215	220	228	221	225
29	226	221	223	---	---	---	223	217	220	232	226	230
30	234	225	230	---	---	---	223	218	221	231	227	230
31	246	233	240	---	---	---	224	219	222	229	226	228
MONTH	247	202	223							245	188	225

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
	FEBRUARY			MARCH			APRIL			MAY		
1	232	227	228	245	243	244	242	235	239	166	161	163
2	227	224	226	245	244	244	243	226	235	167	162	164
3	228	224	226	247	246	246	226	222	224	175	165	169
4	227	226	227	247	245	246	226	223	225	179	169	173
5	226	225	225	250	238	248	222	215	219	180	175	177
6	226	224	225	251	249	250	217	209	213	183	176	180
7	226	222	224	252	248	251	214	191	201	186	180	182
8	224	222	223	255	248	252	198	175	184	195	181	187
9	223	218	221	253	248	251	204	184	193	198	194	196
10	222	220	221	252	248	249	214	180	193	196	193	195
11	223	221	221	249	247	248	207	189	196	202	192	196
12	225	223	224	250	245	248	210	174	193	203	197	200
13	227	224	224	250	245	248	203	181	188	204	193	197
14	230	225	228	247	242	244	189	177	183	210	192	199
15	232	230	231	246	239	242	188	180	183	195	186	191
16	234	232	233	242	238	240	186	176	183	205	193	198
17	235	232	234	240	236	238	188	180	185	210	197	203
18	236	235	236	245	237	240	182	179	181	219	207	212
19	238	237	237	245	238	241	180	176	178	225	214	219
20	239	237	239	245	237	240	177	169	173	224	215	219
21	242	240	242	242	234	239	172	167	170	221	213	217
22	243	241	243	242	233	237	178	170	174	223	213	219
23	244	242	243	241	232	236	176	171	173	231	216	226
24	245	242	244	244	234	239	177	168	174	236	222	229
25	243	241	242	237	232	235	174	167	171	239	230	233
26	243	241	243	247	235	239	170	166	168	241	228	236
27	245	239	244	243	235	239	168	164	166	247	238	242
28	245	244	245	241	232	237	170	163	166	255	246	253
29	---	---	---	240	230	236	167	160	162	257	249	252
30	---	---	---	242	237	240	164	160	161	264	248	253
31	---	---	---	244	239	241	---	---	---	255	240	250
MONTH	245	218	232	255	230	243	243	160	188	264	161	207



## 111

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
	JUNE			JULY			AUGUST			SEPTEMBER		
1	243	235	238	224	213	219	213	206	211	236	206	219
2	248	237	243	226	215	222	228	211	220	246	216	224
3	247	237	241	228	217	223	227	216	222	224	215	219
4	239	237	238	237	220	226	225	221	223	233	220	227
5	238	234	236	228	218	224	230	216	222	241	233	236
6	238	232	236	231	216	224	228	225	227	259	237	250
7	239	230	235	261	211	234	227	219	224	259	250	254
8	236	232	234	260	226	239	226	219	223	260	253	257
9	239	233	236	249	227	241	224	217	219	262	257	258
10	245	230	236	245	227	239	221	215	218	269	259	264
11	255	235	241	242	234	239	223	216	220	273	235	259
12	260	229	240	236	215	226	225	219	222	238	171	200
13	227	196	211	228	218	223	226	222	224	179	169	174
14	195	188	190	249	221	228	227	220	223	203	166	184
15	197	187	193	250	220	238	229	214	222	192	186	188
16	212	196	203	237	228	233	233	220	226	188	181	184
17	214	200	208	237	219	231	227	221	223	189	179	185
18	220	212	216	269	238	245	232	226	229	198	184	191
19	218	209	214	263	244	248	237	231	232	202	195	199
20	219	210	214	253	225	235	235	229	232	207	199	204
21	226	205	213	225	202	208	242	235	238	210	202	206
22	228	210	216	238	196	212	242	237	240	215	203	210
23	214	208	210	235	217	222	243	192	211	211	201	208
24	219	207	212	226	218	221	191	172	178	214	204	210
25	217	209	213	218	206	211	178	172	174	210	201	206
26	218	210	214	238	214	227	186	177	182	216	204	211
27	225	195	208	225	219	221	194	186	189	218	203	209
28	217	200	207	224	213	217	198	191	195	211	204	207
29	217	206	212	222	210	215	199	193	195	219	203	212
30	221	207	214	220	212	216	205	194	198	217	210	214
31	---	---	---	215	207	212	229	196	208	---	---	---
MONTH	260	187	221	269	196	226	243	172	215	273	166	216

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
	OCTOBER			NOVEMBER			DECEMBER			JANUARY		
1	12.0	10.0	11.0	9.5	7.5	8.5	---	---	---	.0	.0	.0
2	12.0	8.5	10.0	9.5	8.0	9.0	---	---	---	.0	.0	.0
3	12.5	8.0	10.0	10.0	9.5	9.5	---	---	---	.0	.0	.0
4	12.5	7.5	9.5	9.0	6.0	7.5	---	---	---	.0	.0	.0
5	13.0	8.5	10.5	6.0	4.5	5.5	---	---	---	.0	.0	.0
6	11.0	7.0	8.5	6.0	4.5	5.0	.5	.0	.0	.0	.0	.0
7	9.0	5.5	7.0	7.0	6.0	6.5	.0	.0	.0	.0	.0	.0
8	8.5	7.0	8.0	8.0	6.5	7.0	.0	.0	.0	.0	.0	.0
9	8.0	7.0	7.5	9.0	7.5	8.5	.0	.0	.0	.5	.0	.0
10	8.5	6.0	7.0	---	---	---	.0	.0	.0	.5	.0	.0
11	8.5	7.0	8.0	---	---	---	.0	.0	.0	.5	.0	.0
12	7.0	6.0	6.5	---	---	---	.0	.0	.0	.5	.0	.0
13	7.0	5.0	6.0	---	---	---	.5	.0	.0	.5	.0	.0
14	7.5	5.5	6.5	---	---	---	.0	.0	.0	.0	.0	.0
15	7.0	5.5	6.5	---	---	---	.0	.0	.0	.0	.0	.0
16	7.0	4.5	5.5	---	---	---	.0	.0	.0	.0	.0	.0
17	7.0	4.0	5.5	---	---	---	.5	.0	.0	.0	.0	.0
18	8.5	5.5	7.0	---	---	---	.5	.0	.0	.0	.0	.0
19	9.5	6.0	7.5	---	---	---	.0	.0	.0	.0	.0	.0
20	9.5	5.5	7.5	---	---	---	.5	.0	.0	.0	.0	.0
21	9.5	6.5	7.5	---	---	---	.0	.0	.0	.0	.0	.0
22	8.5	5.5	7.0	---	---	---	.0	.0	.0	.0	.0	.0
23	8.5	4.5	6.0	---	---	---	.0	.0	.0	.0	.0	.0
24	9.5	5.0	7.0	---	---	---	.0	.0	.0	.0	.0	.0
25	11.0	7.5	9.0	---	---	---	.0	.0	.0	.0	.0	.0
26	12.0	7.5	9.5	---	---	---	.5	.0	.0	.0	.0	.0
27	10.5	7.0	9.0	---	---	---	.5	.0	.0	.0	.0	.0
28	10.5	6.0	7.5	---	---	---	.0	.0	.0	.0	.0	.0
29	9.5	5.5	7.0	---	---	---	.0	.0	.0	.0	.0	.0
30	9.0	5.5	7.0	---	---	---	.0	.0	.0	.0	.0	.0
31	9.0	6.5	8.0	---	---	---	.5	.0	.0	.0	.0	.0
MONTH	13.0	4.0	7.5							.5	.0	.0

STREAMS TRIBUTARY TO LAKE MICHIGAN  
04059000 ESCANABA RIVER AT CORNELL, MI--CONTINUED

TEMPERATURE (DEG. C) OF WATER, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
	FEBRUARY			MARCH			APRIL			MAY		
1	.0	.0	.0	.0	.0	.0	.5	.0	.0	7.0	4.5	5.5
2	.0	.0	.0	.0	.0	.0	.5	.0	.0	8.5	5.0	6.0
3	.0	.0	.0	.5	.0	.0	1.5	.0	1.0	9.0	5.5	7.0
4	.0	.0	.0	.5	.0	.0	1.0	.0	.5	10.0	6.5	8.0
5	.0	.0	.0	.5	.0	.0	1.0	.0	.5	11.5	7.0	9.0
6	.0	.0	.0	.5	.0	.0	1.5	.5	1.0	12.0	7.0	9.0
7	.0	.0	.0	.5	.0	.0	2.0	.5	1.5	13.0	7.0	10.0
8	.0	.0	.0	.0	.0	.0	1.5	1.0	1.0	10.5	7.5	9.5
9	.0	.0	.0	.0	.0	.0	1.5	1.0	1.0	9.5	7.5	8.5
10	.0	.0	.0	.0	.0	.0	1.5	1.0	1.0	12.0	7.0	9.5
11	.0	.0	.0	.0	.0	.0	1.5	.5	1.0	14.0	8.5	10.5
12	.0	.0	.0	.0	.0	.0	2.0	.0	1.0	11.5	8.0	10.0
13	.0	.0	.0	.5	.0	.0	1.5	.0	.5	8.5	5.0	7.0
14	.0	.0	.0	.5	.0	.0	1.0	.0	.0	6.0	4.5	5.5
15	.0	.0	.0	.5	.0	.0	.5	.0	.0	11.0	5.0	8.0
16	.0	.0	.0	.5	.0	.0	1.5	.0	.5	14.0	9.0	12.0
17	.0	.0	.0	.0	.0	.0	4.0	.5	2.0	16.5	12.0	14.0
18	.0	.0	.0	.0	.0	.0	3.0	1.5	2.0	17.5	13.5	15.5
19	.0	.0	.0	.5	.0	.5	2.5	1.0	1.5	20.0	15.0	17.5
20	.0	.0	.0	.0	.0	.0	2.0	.5	1.0	17.5	14.0	16.0
21	.0	.0	.0	.0	.0	.0	3.5	.0	1.5	17.0	12.0	14.0
22	.0	.0	.0	.5	.0	.0	3.5	.0	1.5	18.5	11.5	14.5
23	.0	.0	.0	.5	.0	.5	4.0	1.0	2.0	18.5	12.0	14.5
24	.0	.0	.0	.5	.0	.0	7.0	2.5	4.0	20.5	12.5	16.0
25	.0	.0	.0	1.0	.0	.0	6.5	3.0	5.0	20.0	14.0	17.0
26	.0	.0	.0	1.0	.0	.5	7.0	4.0	5.5	24.0	16.5	19.5
27	.0	.0	.0	1.0	.5	.5	7.5	5.0	6.5	24.5	18.0	21.0
28	.0	.0	.0	1.0	.0	.5	8.5	5.5	7.5	23.5	18.0	20.5
29	---	---	---	.5	.0	.0	8.5	6.5	7.5	22.5	19.0	20.5
30	---	---	---	.5	.0	.0	8.0	5.5	6.5	23.0	18.5	20.5
31	---	---	---	1.0	.0	.5	---	---	---	20.5	15.0	18.5
MONTH	.0	.0	.0	1.0	.0	.0	8.5	.0	2.0	24.5	4.5	12.5

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
	JUNE			JULY			AUGUST			SEPTEMBER		
1	18.5	15.0	16.0	20.0	18.0	18.5	21.5	14.0	17.0	17.0	14.0	15.5
2	18.5	13.5	15.5	24.5	17.0	20.5	22.0	15.5	18.0	18.5	15.0	16.5
3	19.5	14.0	16.0	27.0	17.5	21.5	19.5	14.5	17.0	18.5	15.5	17.0
4	16.0	14.0	15.0	28.0	15.5	21.0	22.5	14.0	18.0	18.5	14.5	16.5
5	20.0	12.5	15.5	26.0	17.0	21.0	24.5	14.5	19.0	18.5	16.5	17.5
6	21.5	12.0	16.5	26.5	19.5	22.5	25.5	16.5	20.5	20.0	17.0	18.0
7	17.0	11.5	14.5	24.0	20.0	21.5	27.0	17.5	21.5	18.5	17.0	17.5
8	21.0	10.0	15.0	26.0	18.0	21.5	27.0	18.0	22.0	17.5	15.5	16.5
9	21.0	12.0	15.5	24.0	18.5	20.5	24.5	16.5	20.5	17.5	15.5	16.5
10	20.5	11.5	15.5	23.5	15.0	19.0	26.0	15.0	20.5	20.0	16.5	18.0
11	19.5	14.5	17.0	26.5	14.0	19.0	26.0	16.0	21.0	18.0	16.0	17.0
12	16.5	14.0	15.5	24.0	14.0	18.5	26.5	18.0	21.5	17.5	14.0	15.5
13	16.0	12.0	13.5	26.0	17.5	21.0	29.0	18.0	23.5	14.5	13.0	13.5
14	14.0	11.5	12.5	26.0	15.0	20.5	28.5	19.5	23.5	14.0	13.0	13.5
15	16.5	12.0	14.0	24.5	17.0	20.0	27.0	19.0	22.5	14.0	12.5	13.0
16	17.0	13.5	15.5	25.5	14.0	19.5	20.0	18.0	19.0	13.5	12.0	12.5
17	20.0	14.0	17.5	25.0	16.5	20.5	19.0	17.0	18.0	13.5	12.5	13.0
18	23.5	15.5	18.5	24.0	19.0	21.0	18.5	17.0	17.5	12.5	11.5	12.0
19	23.5	14.0	18.0	27.0	19.5	22.5	18.5	16.5	17.5	13.5	11.5	12.5
20	22.0	14.5	18.0	23.0	19.0	20.5	17.5	14.0	15.5	13.5	12.5	13.0
21	20.5	14.5	18.0	23.0	18.5	20.0	18.0	14.5	16.0	13.5	11.5	12.5
22	21.0	10.0	15.5	19.5	15.5	17.5	20.5	16.0	18.0	13.0	11.5	12.0
23	18.0	10.0	13.5	20.0	15.5	17.0	17.5	14.5	15.5	13.5	10.5	12.0
24	24.5	12.0	18.0	20.0	16.0	18.0	16.5	15.5	16.0	14.0	11.5	12.5
25	23.0	15.0	18.0	21.5	17.0	18.5	15.5	14.5	15.0	13.0	10.0	11.5
26	26.5	17.0	21.0	20.5	17.5	18.5	16.0	14.5	15.0	14.0	11.0	12.5
27	27.0	18.5	22.0	20.0	16.5	18.0	17.0	16.0	16.0	13.5	11.5	12.5
28	26.5	17.0	22.0	19.0	15.0	17.0	17.5	15.5	16.5	12.5	9.5	11.0
29	28.0	19.5	23.5	17.5	14.5	16.5	17.0	15.5	16.5	11.5	10.5	11.0
30	26.5	18.0	22.0	19.5	13.5	16.0	16.0	15.0	15.5	12.0	11.0	11.5
31	---	---	---	18.5	13.5	15.5	15.5	13.0	14.0	---	---	---
MONTH	28.0	10.0	17.0	28.0	13.5	19.5	29.0	13.0	18.5	20.0	9.5	14.0

## STREAMS TRIBUTARY TO LAKE MICHIGAN

113

04059500 FORD RIVER NEAR HYDE, MI  
(National stream-quality accounting network station)

LOCATION.--Lat 45°45'20", long 87°12'05", in SW¼ sec.19, T.39 N., R.23 W., Delta County, Hydrologic Unit 04030109, on right bank 40 ft (12 m) downstream from bridge on County Road 533, 1.4 mi (2.3 km) downstream from Termile Creek, and 1.5 mi (2.4 km) north of Hyde.

DRAINAGE AREA.--450 mi<sup>2</sup> (1,166 km<sup>2</sup>).

## WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--October 1954 to current year.

GAGE.--Water-stage recorder. Datum of gage is 677.9 ft (206.62 m) National Geodetic Vertical Datum of 1929.

REMARKS.--Water-discharge records good except those for the winter period, which are fair.

AVERAGE DISCHARGE.--24 years, 378 ft<sup>3</sup>/s (10.70 m<sup>3</sup>/s), 11.41 in/yr (290 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 7,590 ft<sup>3</sup>/s (215 m<sup>3</sup>/s) May 7, 1960, gage height, 8.27 ft (2.521 m); minimum, 18 ft<sup>3</sup>/s (0.510 m<sup>3</sup>/s) Aug. 30, 1976, gage height, 1.33 ft (0.405 m).

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 3,180 ft<sup>3</sup>/s (90.1 m<sup>3</sup>/s) Sept. 15, gage height, 5.83 ft (1.777 m); maximum gage height, 6.27 ft (1.911 m) Apr. 7, backwater from ice; minimum discharge, 64 ft<sup>3</sup>/s (1.81 m<sup>3</sup>/s) July 6, 7, gage height, 1.68 ft (0.512 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	791	298	275	205	125	110	250	1140	464	88	449	1280
2	668	438	260	200	125	110	290	1010	443	82	383	1000
3	565	1180	255	195	125	105	285	889	406	75	362	917
4	490	2230	240	195	120	105	280	771	351	71	317	746
5	441	1780	230	195	120	105	330	687	302	67	273	642
6	392	1510	225	190	120	100	500	619	264	65	233	542
7	344	1580	225	190	120	100	750	560	236	81	196	510
8	613	1500	225	185	120	100	950	556	217	184	167	453
9	1100	1340	225	180	120	100	1050	652	198	174	143	412
10	1080	1310	225	170	120	100	1200	687	189	155	124	384
11	1120	1170	225	165	120	100	1350	681	186	146	107	599
12	1140	1010	230	160	120	100	1430	838	241	123	95	1020
13	1080	859	230	165	120	100	1670	898	470	105	87	1070
14	988	744	240	170	120	100	1570	1600	564	91	78	1750
15	878	673	250	175	120	100	1520	1800	638	119	71	2990
16	748	625	255	180	115	100	1400	1630	722	119	530	2230
17	640	580	260	180	115	100	1400	1480	713	119	684	1740
18	565	533	270	180	115	100	1440	1300	609	128	562	1510
19	507	490	280	175	115	100	1600	1110	476	173	574	1500
20	464	522	285	170	115	100	1910	910	365	218	551	1290
21	427	673	280	165	115	105	1810	747	290	255	464	1100
22	393	606	275	165	110	105	1680	627	241	343	384	941
23	355	565	270	160	110	105	1600	529	202	736	671	806
24	327	589	260	160	110	105	1540	457	175	822	1610	606
25	310	422	250	155	110	110	1530	396	153	777	1660	605
26	297	386	245	150	110	120	1520	348	140	782	1540	543
27	283	360	240	145	110	130	1480	309	127	927	1610	613
28	269	330	230	140	110	140	1440	334	115	799	2510	649
29	255	310	225	135	---	160	1380	398	105	696	2350	740
30	244	290	220	130	---	190	1270	448	95	600	1830	955
31	243	---	210	130	---	220	---	475	---	511	1480	---
TOTAL	18017	24903	7615	5260	3275	3525	36425	24886	9697	9631	22095	30403
MEAN	581	830	246	170	117	114	1214	803	323	311	713	1013
MAX	1140	2230	285	205	125	220	1910	1800	722	927	2510	2990
MIN	243	290	210	130	110	100	250	309	95	65	71	384
CFSM	1.29	1.84	.55	.38	.26	.25	2.70	1.78	.72	.69	1.58	2.25
IN.	1.49	2.06	.63	.43	.27	.29	3.01	2.06	.80	.80	1.83	2.51

CAL YR 1977 TOTAL 136489 MEAN 374 MAX 2390 MIN 24 CFSM .83 IN 11.28  
WTR YR 1978 TOTAL 195732 MEAN 536 MAX 2990 MIN 65 CFSM 1.19 IN 16.18

## WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1956 to current year.

PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE: Maximum 1974 to current year.

WATER TEMPERATURES: July 1956 to current year.

INSTRUMENTATION.--Temperature recorder July 1956 to September 1975. Water-quality monitor since October 1975.

REMARKS.--Interruptions in the record were due to malfunctions of the instrument. Monthly samples are collected as a cross-section sample in reach of stream 200 ft (61 m) upstream to 200 ft (61 m) downstream from gage.

EXTREMES FOR PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE: Maximum, 482 micromhos Dec. 2, 1976; minimum recorded, 131 micromhos May 22, 1976.

WATER TEMPERATURES: Maximum, 31.0°C July 31, 1975; minimum, 0.0°C on many days during winter periods.

EXTREMES FOR CURRENT YEAR.--

SPECIFIC CONDUCTANCE: Maximum recorded, 384 micromhos Mar. 25; minimum recorded, 189 micromhos Nov. 5, 6.

WATER TEMPERATURES: Maximum, 29.0°C Aug. 14; minimum, 0.0°C on many days during winter period.

## WATER QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DATE	TIME	STREAM- FLOW, INSTAN- TANEOUS (CFS)	SPE- CIFIC CON- DUCT- ANCE (MICRO- MHOS)	PH (UNITS)	TEMPER- ATURE (DEG C)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION)	COLI- FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML)	STREP- TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML)	HARD- NESS NFSS (MG/L AS CaCO3)	HARD- NESS, NONCAR- BONATE (MG/L CaCO3)
OCT											
07...	1130	345	248	7.8	7.0	11.6	95	K9	14	160	24
NOV											
03...	1130	1110	244	7.5	9.5	10.3	93	K230	K590	150	21
DEC											
05...	1130	1170	300	7.6	.0	16.2	120	K4	K3	180	31
JAN											
16...	1100	183	335	7.3	.0	10.1	70	K6	10	180	25
FEB											
05...	1200	118	330	7.5	.0	9.8	67	K2	<1	200	27
MAR											
09...	1100	103	380	7.4	.0	11.4	79	<1	--	190	12
APR											
11...	1130	1410	234	7.5	.5	13.6	98	7	K6	120	14
MAY											
19...	1200	1120	218	7.8	17.0	9.3	97	K7	30	120	21
JUN											
14...	1200	565	230	8.0	13.0	10.5	100	61	54	130	14
JUL											
11...	1230	148	290	8.2	19.5	9.6	104	--	--	160	16
AUG											
16...	1115	620	257	8.1	22.0	7.7	91	>200	K1500	100	12
SEP											
21...	1300	1090	260	7.8	13.5	9.5	93	K7	50	140	14

DATE	CALCIUM DIS- SOLVED (MG/L AS CA)	MAGNE- SIUM, DIS- SOLVED (MG/L AS MG)	SODIUM, DIS- SOLVED (MG/L AS NA)	SODIUM AN- SORP- TION RATIO	SODIUM PERCENT	POTAS- SIUM, DIS- SOLVED (MG/L AS K)	BICAR- BONATE (MG/L AS HCO3)	CAR- BONATE (MG/L AS CO3)	ALKA- LITY (MG/L AS CaCO3)	CARBON DIOXIDE DIS- SOLVED (MG/L AS CO2)	SULFATE DIS- SOLVED (MG/L AS SO4)
OCT											
07...	37	16	.3	.0	0	.7	164	0	130	4.2	20
NOV											
03...	40	13	1.1	.0	2	1.2	162	0	130	8.2	20
DEC											
05...	44	17	1.3	.0	2	.6	182	0	150	7.3	21
JAN											
16...	44	18	1.5	.0	2	.7	194	0	160	16	19
FEB											
05...	47	20	1.4	.0	2	.7	210	0	170	11	21
MAR											
09...	44	20	1.5	.0	2	.8	220	0	180	14	22
APR											
11...	30	12	1.0	.0	2	.7	134	0	110	6.8	14
MAY											
19...	28	12	1.4	.1	2	.7	120	0	98	3.0	13
JUN											
14...	31	13	1.0	.0	2	.6	142	0	120	2.3	10
JUL											
11...	38	17	1.3	.0	2	.9	182	0	149	1.8	9.1
AUG											
16...	25	9.6	5.4	.2	10	1.2	110	0	90	1.4	8.2
SEP											
21...	34	13	1.0	.0	2	.6	152	0	125	3.9	6.7

K--RESULTS BASED ON COLONY COUNT OUTSIDE THE ACCEPTABLE RANGE (NON-IDEAL COLONY COUNT)

STREAMS TRIBUTARY TO LAKE MICHIGAN  
04059500 FORD RIVER NEAR HYDE, MI--CONTINUED

115

WATER-QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978--CONTINUED

DATE	CHLO- RIDE, DIS- SOLVED (MG/L AS CL)	FLUO- RIDE, DIS- SOLVED (MG/L AS F)	SILICA, DIS- SOLVED (MG/L AS SiO2)	SOLIDS, RESIDUE AT 180 DEG. C DIS- SOLVED (MG/L)	SOLIDS, SUM OF CONSTI- TUENTS, DIS- SOLVED (MG/L)	SOLIDS, DIS- SOLVED (TONS PER DAY)	NITRO- GEN, NO2+NO3 TOTAL (MG/L AS N)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N)	NITRO- GEN, ORGANIC TOTAL (MG/L AS N)	NITRO- GEN,AM- MONIA + ORGANIC TOTAL (MG/L AS N)
OCT										
07...	2.3	.0	7.9	205	165	191	.01	.01	--	--
NOV										
03...	2.4	.1	5.9	198	164	593	.11	.01	--	--
DEC										
06...	2.3	.1	7.8	205	184	94.1	--	--	--	--
JAN										
16...	2.7	.0	8.6	203	190	100	.19	.03	--	--
FEB										
06...	2.5	.1	9.6	209	206	66.6	.21	.05	.35	.40
MAR										
09...	3.3	.1	9.9	213	210	59.2	.23	.01	.22	.23
APR										
11...	2.3	.1	5.9	150	132	571	.27	.01	.36	.37
MAY										
19...	1.3	.3	3.5	149	119	451	.02	.07	.59	.66
JUN										
14...	3.2	.1	6.0	173	135	264	.04	.02	.76	.78
JUL										
11...	2.5	.1	5.1	192	164	76.7	.01	.01	.56	.57
AUG										
16...	2.4	.0	5.2	168	111	281	.08	.00	.43	.43
SEP										
21...	2.2	.0	8.0	191	140	562	.01	.02	.70	.72

DATE	NITRO- GEN, NH4 + ORG. SUSP. TOTAL (MG/L AS N)	NITRO- GEN, AM- MONIA + ORGANIC DIS. (MG/L AS N)	NITRO- GEN, TOTAL (MG/L AS N)	NITRO- GEN, TOTAL (MG/L AS NO3)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, DIS- SOLVED (MG/L AS P)	CARRON, ORGANIC TOTAL (MG/L AS C)	SEDI- MENT, SUS- PENDE (MG/L)	SEDI- MENT DIS- CHARGE, SUS- PENDE (T/DAY)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM
OCT										
07...	--	.72	--	--	.01	.01	--	3	2.8	100
NOV										
03...	--	.59	--	--	.03	.01	8.7	100	300	100
DEC										
06...	--	1.2	--	--	.02	.01	9.2	2	--	100
JAN										
16...	--	.34	--	--	.01	.00	10	1	.49	100
FEB										
06...	.09	.31	.61	2.7	.00	.00	--	1	.32	100
MAR										
09...	.00	--	.46	2.0	.00	.00	8.5	1	.28	100
APR										
11...	.00	--	.64	2.8	.01	.00	--	25	95	100
MAY										
19...	.10	.56	.68	3.0	.02	.00	7.5	6	18	100
JUN										
14...	.15	.63	.82	3.6	.02	.00	7.5	8	12	100
JUL										
11...	.06	.51	.58	2.6	.01	.00	--	3	1.2	100
AUG										
16...	.00	--	.51	2.3	.01	.01	11	30	50	100
SEP										
21...	.03	.69	.73	3.2	.01	.01	24	7	21	100



STREAMS TRIBUTARY TO LAKE MICHIGAN  
04059500 FORD RIVER NEAR HYDE, MI--CONTINUED

WATER-QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978--CONTINUED

DATE	TIME	ARSENIC TOTAL (UG/L AS AS)	ARSENIC DIS- SOLVED (UG/L AS AS)	BARIUM, TOTAL RECOV- ERABLE (UG/L AS BA)	BARIUM, DIS- SOLVED (UG/L AS BA)	CADMIUM TOTAL RECOV- ERABLE (UG/L AS CD)	CADMIUM DIS- SOLVED (UG/L AS CD)	CHRO- MIUM, TOTAL RECOV- ERABLE (UG/L AS CR)	CHRO- MIUM, DIS- SOLVED (UG/L AS CR)	COBALT, TOTAL RECOV- ERABLE (UG/L AS CO)
OCT 07...	1130	0	0	0	0	2	2	<10	7	0
JAN 16...	1100	1	0	0	0	1	1	30	0	0
FEB 06...	1200	--	--	--	--	--	--	--	--	--
APR 11...	1130	1	1	0	0	0	0	<10	1	0
JUL 11...	1230	1	1	0	0	3	0	10	0	0

DATE	COBALT, DIS- SOLVED (UG/L AS CO)	COPPER, TOTAL RECOV- ERABLE (UG/L AS CU)	COPPER, DIS- SOLVED (UG/L AS CU)	IRON, TOTAL RECOV- ERABLE (UG/L AS FE)	IRON, DIS- SOLVED (UG/L AS FE)	LEAD, TOTAL RECOV- ERABLE (UG/L AS PB)	LEAD, DIS- SOLVED (UG/L AS PB)	MANGA- NESE, TOTAL RECOV- ERABLE (UG/L AS MN)	MANGA- NESE, DIS- SOLVED (UG/L AS MN)	MERCURY TOTAL RECOV- ERABLE (UG/L AS HG)
OCT 07...	0	4	2	810	350	12	11	20	20	<.5
JAN 16...	0	4	2	170	160	7	3	10	10	<.5
FEB 06...	--	--	--	--	--	--	--	--	--	--
APR 11...	0	7	2	430	150	30	3	20	10	<.5
JUL 11...	0	6	2	190	70	1	1	40	20	<.5

DATE	MERCURY DIS- SOLVED (UG/L AS HG)	SELF- NIUM, TOTAL (UG/L AS SF)	SELF- NIUM, DIS- SOLVED (UG/L AS SE)	SILVER, TOTAL RECOV- ERABLE (UG/L AS AG)	SILVER, DIS- SOLVED (UG/L AS AG)	ZINC, TOTAL RECOV- ERABLE (UG/L AS ZN)	ZINC, DIS- SOLVED (UG/L AS ZN)	CARBON, ORGANIC DIS- SOLVED (MG/L AS C)	CARBON, ORGANIC SUS- PENDED TOTAL (MG/L AS C)
OCT 07...	<.5	0	0	0	0	20	10	--	.3
JAN 16...	<.5	0	0	0	0	20	0	--	--
FEB 06...	--	--	--	--	--	--	--	12	.0
APR 11...	<.5	0	0	1	0	20	20	9.9	--
JUL 11...	<.5	0	0	0	0	10	0	17	--

QUALITATIVE AND ASSOCIATED QUANTITATIVE ANALYSES OF BIOLOGICAL DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
PERIPHYTON

DATE	TIME	LENGTH OF EXPO- SURE (DAYS)	PERI- PHYTON BIOMASS ASH WEIGHT G/SQ M	PERI- PHYTON BIOMASS TOTAL DRY WEIGHT G/SQ M	CHLOR-A PERI- PHYTON TOTAL CHROMO- GRAPHIC FLUOROM (MG/M2)	CHLOR-B PERI- PHYTON TOTAL CHROMO- GRAPHIC FLUOROM (MG/M2)
NOV 03...	1130	27	.079	.157	.176	.004

STREAMS TRIBUTARY TO LAKE MICHIGAN  
04059500 FORD RIVER NEAR HYDE, MI--CONTINUED

117

SPECIFIC CONDUCTANCE (MICROMHOS/CM AT 25 DEG. C), WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
OCTOBER			NOVEMBER			DECEMBER			JANUARY			
1	---	---	---	---	---	---	268	266	267	300	298	299
2	---	---	---	---	---	---	259	269	269	302	299	301
3	---	---	---	---	---	---	271	270	270	305	302	304
4	---	---	---	191	190	190	274	271	273	306	303	305
5	---	---	---	190	189	190	276	274	275	306	305	306
6	---	---	---	191	189	190	280	275	277	307	303	305
7	---	---	---	192	191	191	280	278	279	305	300	303
8	---	---	---	194	192	193	281	281	281	308	302	305
9	---	---	---	195	193	194	283	282	283	316	309	312
10	261	254	---	198	195	196	285	283	284	321	316	319
11	259	254	256	195	194	195	292	285	290	322	316	318
12	256	247	250	196	195	196	294	292	294	323	316	320
13	---	---	---	197	195	196	297	289	294	317	314	315
14	---	---	---	198	197	198	291	286	288	320	317	318
15	---	---	---	199	197	198	288	281	284	322	313	318
16	---	---	---	202	200	201	282	279	281	316	312	314
17	---	---	---	202	202	202	283	281	282	318	313	315
18	---	---	---	205	203	203	283	282	283	318	313	315
19	---	---	---	206	203	205	283	281	282	315	313	314
20	---	---	---	206	202	203	282	278	280	317	314	316
21	---	---	---	209	205	207	283	280	281	317	313	315
22	---	---	---	209	207	208	282	281	281	320	316	319
23	---	---	---	210	205	208	285	282	283	319	316	317
24	---	---	---	212	206	208	286	282	284	318	317	317
25	---	---	---	260	213	255	286	284	285	321	317	319
26	---	---	---	264	259	260	289	286	288	323	319	321
27	---	---	---	265	265	265	293	289	291	322	320	322
28	---	---	---	267	266	266	296	294	295	323	320	322
29	---	---	---	268	264	266	302	296	299	323	320	322
30	---	---	---	268	265	267	305	303	303	328	323	325
31	---	---	---	---	---	---	310	298	304	328	324	326
MONTH							310	266	284	328	298	314
DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
FEBRUARY			MARCH			APRIL			MAY			
1	329	326	328	353	350	352				---	---	---
2	331	328	329	357	353	355				---	---	---
3	334	331	333	355	353	354				---	---	---
4	336	332	334	359	355	357				---	---	---
5	334	332	334	359	356	358				---	---	---
6	335	332	333	362	352	356				---	---	---
7	333	329	331	360	355	358				---	---	---
8	333	330	331	361	356	359				---	---	---
9	334	331	333	360	356	358				---	---	---
10	335	331	334	358	357	358				---	---	---
11	335	332	334	360	355	358				---	---	---
12	335	331	334	360	357	359				---	---	---
13	333	331	333	361	359	360				---	---	---
14	337	334	336	362	361	361				---	---	---
15	336	334	335	365	361	363				---	---	---
16	342	336	341	365	363	364				---	---	---
17	347	343	345	368	365	366				---	---	---
18	346	340	343	370	367	369				---	---	---
19	347	345	346	369	365	367				---	---	---
20	351	345	348	372	368	370				---	---	---
21	346	344	345	372	371	371				---	---	---
22	349	345	347	373	368	371				---	---	---
23	348	346	348	375	371	373				---	---	---
24	350	348	349	380	377	378				---	---	---
25	349	348	349	384	377	380				300	299	300
26	350	348	350	383	376	380				302	299	301
27	351	350	350	383	375	379				304	301	303
28	352	350	351	378	373	375				306	302	304
29	---	---	---	375	372	374				305	301	303
30	---	---	---	375	373	374				303	299	301
31	---	---	---	---	---	---				299	293	297
MONTH	352	326	339	384	350	365						

STREAMS TRIBUTARY TO LAKE MICHIGAN  
04059500 FORD RIVER NEAR HYDE, MI--CONTINUED

SPECIFIC CONDUCTANCE (MICROMHOS/CM AT 25 DEG. C) • WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
	JUNE			JULY			AUGUST			SEPTEMBER		
1	292	285	289	316	313	315	244	238	241	254	225	236
2	285	264	278	321	316	319	248	245	247	257	254	256
3	265	259	262	329	318	322	246	244	246	261	254	258
4	263	256	260	328	323	325	243	241	242	263	261	262
5	281	256	273	328	322	326	250	249	245	265	261	264
6	285	279	282	340	326	335	250	245	248	266	264	265
7	285	283	284	343	317	331	273	244	261	267	266	266
8	286	281	284	335	293	305	282	272	278	268	266	267
9	288	283	285	289	285	287	291	285	288	270	267	268
10	286	284	285	290	287	289	294	290	292	274	266	270
11	286	284	285	308	289	294	301	297	299	274	267	271
12	284	281	282	312	307	309	305	302	304	274	268	271
13	280	241	260	316	307	311	312	307	309	268	266	267
14	248	225	234	326	297	313	318	315	316	267	258	265
15	227	195	207	309	292	300	320	312	317	233	219	227
16	195	192	194	321	308	316	315	256	283	237	220	230
17	197	195	196	322	312	317	257	250	254	237	233	235
18	204	199	201	322	303	311	260	250	257	262	236	242
19	217	207	211	317	304	311	263	260	262	265	259	262
20	239	218	228	315	312	314	264	263	263	269	265	267
21	248	240	243	312	300	307	265	263	265	269	268	269
22	243	237	240	303	285	296	265	264	265	270	268	269
23	280	235	251	287	239	262	266	256	262	272	269	270
24	277	272	274	238	228	231	257	212	226	272	269	271
25	283	278	280	231	228	229	221	214	217	273	272	273
26	288	281	284	231	229	230	216	214	215	273	271	273
27	297	290	293	229	225	227	220	212	216	274	273	273
28	305	295	299	231	227	230	226	211	219	274	273	273
29	311	299	304	235	232	234	231	215	225	273	263	270
30	313	306	309	238	236	237	232	217	228	272	265	270
31	---	---	---	239	235	238	232	229	231	---	---	---
MONTH	313	192	262	343	225	289	320	211	259	274	219	262

TEMPERATURE (DEG. C) OF WATER, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
	OCTOBER			NOVEMBER			DECEMBER			JANUARY		
1	---	---	---	8.5	7.5	8.0	1.0	.5	.5	.0	.0	.0
2	---	---	---	8.5	8.5	8.5	.5	.5	.5	.0	.0	.0
3	---	---	---	9.5	9.0	9.0	.5	.0	.5	.5	.0	.0
4	---	---	---	8.5	6.5	7.0	.5	.0	.5	.5	.0	.0
5	---	---	---	6.5	4.5	5.5	.5	.5	.5	.5	.0	.5
6	---	---	---	5.5	4.5	5.0	.5	.0	.5	.5	.5	.5
7	---	---	---	6.5	5.5	6.0	.0	.0	.0	.5	.5	.5
8	---	---	---	7.5	6.5	7.0	.0	.0	.0	.5	.0	.0
9	---	---	---	9.0	7.5	8.5	.0	.0	.0	.0	.0	.0
10	---	---	---	9.0	6.5	7.5	.0	.0	.0	.0	.0	.0
11	9.0	7.5	8.0	6.5	3.5	4.5	.0	.0	.0	.0	.0	.0
12	7.0	6.5	7.0	3.5	1.5	2.0	.0	.0	.0	.5	.0	.0
13	7.0	5.0	6.0	1.5	.5	1.0	.5	.0	.0	.5	.0	.0
14	7.0	5.5	6.5	2.0	1.0	1.5	.5	.0	.5	.0	.0	.0
15	7.0	6.0	6.5	2.5	1.0	1.5	.5	.0	.0	.5	.0	.0
16	6.5	4.5	5.5	4.0	2.0	3.0	.5	.0	.5	.5	.0	.0
17	7.0	4.5	5.5	2.5	1.5	2.0	.5	.5	.5	.0	.0	.0
18	8.0	6.0	7.0	2.0	1.5	2.0	.5	.0	.5	.0	.0	.0
19	8.5	6.5	7.5	1.5	.0	1.0	.5	.0	.5	.0	.0	.0
20	8.5	5.5	7.0	3.5	1.0	2.0	.5	.0	.0	.0	.0	.0
21	8.5	6.5	7.5	3.0	.0	1.0	.5	.0	.0	.5	.0	.0
22	7.5	5.5	6.5	.0	.0	.0	.0	.0	.0	.0	.0	.0
23	6.5	4.5	5.5	.0	.0	.0	.0	.0	.0	.5	.0	.5
24	8.5	5.5	6.5	.0	.0	.0	.0	.0	.0	.5	.5	.5
25	10.0	8.5	9.0	.0	.0	.0	.0	.0	.0	.5	.5	.5
26	10.0	9.0	9.5	.0	.0	.0	.0	.0	.0	.5	.0	.5
27	9.5	8.0	9.0	.5	.0	.0	.0	.0	.0	.5	.0	.0
28	8.0	6.5	7.0	.5	.5	.5	.0	.0	.0	.5	.0	.0
29	7.0	5.5	6.0	.5	.0	.5	.0	.0	.0	.5	.0	.0
30	7.0	6.0	6.5	.5	.0	.5	.0	.0	.0	.5	.0	.0
31	7.5	6.0	6.5	---	---	---	.0	.0	.0	.0	.0	.0
MONTH				9.5	.0	3.0	1.0	.0	.0	.5	.0	.0

STREAMS TRIBUTARY TO LAKE MICHIGAN  
04059500 FORD RIVER NEAR HYDE, MI--CONTINUED

119

TEMPERATURE (DEG. C) OF WATER, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
FEBRUARY			MARCH			APRIL			MAY			
1	.0	.0	.0	.0	.0	.0	1.0	1.0	1.0	9.5	5.5	7.5
2	.0	.0	.0	.0	.0	.0	1.0	.5	1.0	10.5	5.0	8.0
3	.0	.0	.0	.0	.0	.0	1.0	.5	.5	11.5	7.0	9.0
4	.0	.0	.0	.0	.0	.0	1.0	.5	1.0	12.0	8.5	10.0
5	.0	.0	.0	.0	.0	.0	1.0	1.0	1.0	13.5	9.0	11.0
6	.0	.0	.0	.0	.0	.0	1.0	1.0	1.0	13.5	9.5	11.5
7	.5	.0	.5	.5	.0	.0	1.5	1.0	1.0	14.0	9.5	12.0
8	.5	.0	.0	.5	.0	.0	1.5	.5	1.0	13.5	11.0	11.5
9	.5	.0	.0	.5	.0	.0	1.0	.5	1.0	10.5	9.5	10.0
10	.5	.0	.0	.5	.5	.5	1.0	.5	.5	13.5	8.5	11.0
11	.5	.0	.5	.5	.5	.5	1.0	.5	.5	15.0	10.5	12.5
12	.5	.0	.5	.5	.5	.5	1.5	.5	.5	14.5	11.5	12.5
13	.5	.0	.5	.5	.5	.5	1.5	.5	1.0	11.0	7.5	9.5
14	.0	.0	.0	.5	.5	.5	2.0	.5	1.0	7.5	6.5	7.0
15	.5	.0	.0	.5	.5	.5	4.0	.5	2.0	12.5	6.5	9.0
16	.0	.0	.0	.5	.5	.5	6.0	1.0	3.5	15.5	11.0	13.0
17	.0	.0	.0	.5	.0	.5	6.5	2.5	5.0	18.0	13.0	15.0
18	.0	.0	.0	.5	.0	.5	5.5	4.5	5.0	19.5	15.0	17.0
19	.0	.0	.0	.5	.5	.5	4.5	3.5	4.0	21.0	16.5	18.5
20	.0	.0	.0	.5	.0	.5	4.0	2.0	3.0	19.5	16.5	18.0
21	.0	.0	.0	.5	.5	.5	6.0	.5	3.5	18.0	13.5	15.5
22	.0	.0	.0	1.0	.5	1.0	7.5	2.5	5.0	18.0	13.0	16.0
23	.5	.0	.0	1.0	.0	.5	6.0	4.5	5.5	18.0	14.0	16.5
24	.5	.0	.0	1.0	.5	.5	8.5	5.0	6.5	21.5	15.0	18.0
25	.5	.0	.0	1.0	.5	.5	9.5	5.5	7.5	21.5	17.5	19.5
26	.0	.0	.0	1.0	.5	.5	9.5	6.0	8.0	23.5	18.0	21.0
27	.0	.0	.0	1.0	.5	1.0	10.5	6.0	8.5	25.5	21.5	23.5
28	.0	.0	.0	1.0	1.0	1.0	11.5	7.5	9.5	25.0	22.5	23.5
29	---	---	---	1.0	1.0	1.0	11.5	9.0	10.0	23.5	21.5	22.5
30	---	---	---	1.0	1.0	1.0	10.0	7.0	8.5	24.0	21.0	22.5
31	---	---	---	1.0	1.0	1.0	---	---	---	23.0	19.5	21.5
MONTH	.5	.0	.0	1.0	.0	.5	11.5	.5	3.5	25.5	5.0	14.5

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
	JUNE			JULY			AUGUST			SEPTEMBER		
1	21.5	17.5	18.5	23.5	20.0	22.0	20.0	15.0	17.5	18.5	15.0	16.5
2	18.5	16.5	17.5	22.0	19.0	20.5	21.5	17.0	19.5	19.5	16.5	18.0
3	18.5	15.5	17.5	27.0	21.0	23.5	21.0	17.0	18.5	19.5	17.5	18.0
4	18.0	15.5	16.5	27.5	21.5	24.0	20.5	16.0	18.0	19.5	16.0	18.0
5	18.0	13.5	16.0	27.5	22.0	24.0	22.0	17.5	20.0	20.0	18.0	19.0
6	22.0	16.5	19.0	28.5	24.0	25.5	23.5	20.0	22.0	22.0	17.5	19.5
7	21.5	15.5	18.5	27.0	24.5	25.0	24.5	21.5	23.0	21.5	18.5	19.5
8	18.0	12.0	15.5	25.5	22.0	24.0	25.0	21.5	23.5	19.0	17.5	18.0
9	19.0	16.5	17.5	24.5	22.0	23.0	23.5	21.5	22.5	18.5	17.5	18.0
10	19.5	16.0	18.0	22.0	19.0	21.0	22.5	19.0	21.0	21.5	17.5	19.0
11	20.5	18.5	19.5	22.0	18.0	20.0	24.0	19.5	21.5	21.0	18.5	19.5
12	19.5	16.5	18.0	22.5	18.5	20.5	25.5	21.0	23.0	19.0	15.0	16.5
13	17.5	13.5	15.5	25.0	20.5	22.5	28.0	22.5	25.0	15.0	13.5	14.0
14	16.5	13.0	14.0	26.5	21.0	23.0	29.0	24.0	26.0	14.5	13.0	13.5
15	17.5	12.5	15.0	24.5	21.5	23.0	28.0	24.0	25.5	14.5	13.0	14.0
16	17.5	15.0	16.0	24.0	20.0	22.0	24.0	21.0	22.5	14.0	12.5	13.5
17	19.5	16.0	17.5	25.5	21.0	23.0	21.5	18.0	20.0	14.5	13.0	13.5
18	22.0	17.5	19.0	24.0	22.5	23.5	21.5	18.5	20.0	14.0	13.0	13.0
19	22.5	17.5	20.0	27.0	23.0	24.5	21.0	19.0	20.0	14.0	13.0	13.5
20	22.0	18.5	20.5	26.0	22.0	23.5	20.5	16.5	18.5	14.5	14.0	14.0
21	21.0	18.0	19.5	22.0	20.0	21.5	22.0	17.5	19.5	14.5	13.5	14.0
22	21.5	17.0	19.0	21.5	17.5	19.5	22.0	19.0	20.5	14.0	11.5	12.5
23	21.0	17.5	19.5	20.5	16.0	18.0	21.5	17.5	19.0	14.5	11.5	13.0
24	22.0	18.0	20.0	21.5	17.0	19.0	17.5	16.0	17.0	15.0	12.0	13.5
25	22.5	20.5	21.5	21.5	18.0	20.0	17.0	15.5	16.0	14.5	11.5	13.0
26	24.5	21.0	22.5	21.5	19.0	20.5	17.0	16.0	16.5	14.5	11.5	13.0
27	28.0	23.0	25.5	21.0	18.0	19.5	17.0	16.5	16.5	14.5	13.0	14.0
28	26.0	22.5	24.5	19.0	16.5	17.5	18.0	17.0	17.5	13.0	10.0	12.0
29	28.0	23.0	25.5	17.5	16.5	17.0	18.5	16.5	17.5	12.5	11.5	12.0
30	26.0	23.0	24.5	18.5	14.0	16.5	17.5	16.0	17.0	11.5	11.5	11.5
31	---	---	---	17.5	14.5	16.0	17.5	15.0	16.0	---	---	---
MONTH	28.0	12.0	19.0	28.5	14.0	21.5	29.0	15.0	20.0	22.0	10.0	15.0

## STREAMS TRIBUTARY TO LAKE MICHIGAN

04060500 IRON RIVER AT CASPIAN, MI

LOCATION.--Lat 46°03'31", long 88°37'38", in SE¼ SW¼ sec.1, T.42 N., R.35 W., Iron County, Hydrologic Unit 04030106, on right bank 10 ft (3 m) downstream from bridge on County Highway 424 in Caspian, and 5.0 mi (8.0 km) upstream from mouth.

DRAINAGE AREA.--92.1 mi<sup>2</sup> (238.5 km<sup>2</sup>).

PERIOD OF RECORD.--March 1948 to current year.

REVISED RECORDS.--WSP 1911: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 1,438.78 ft (438.540 m) National Geodetic Vertical Datum of 1929. Prior to Sept. 25, 1969, nonrecording gage at site 10 ft (3 m) upstream at same datum.

REMARKS.--Records good except those for the winter period, which are fair. Prior to Aug. 1978, the average flow includes mine pumpage and sewage effluent. Since August 1978, average flow includes about 1 ft<sup>3</sup>/s (0.03 m<sup>3</sup>/s) sewage effluent. Several observations of water temperature were made during the year.

AVERAGE DISCHARGE.--30 years, 86.6 ft<sup>3</sup>/s (2.453 m<sup>3</sup>/s).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,430 ft<sup>3</sup>/s (40.5 m<sup>3</sup>/s) July 2, 1953, gage height, 10.20 ft (3.109 m); minimum, 25 ft<sup>3</sup>/s (0.71 m<sup>3</sup>/s) Mar. 29, 1969, gage height, 3.30 ft (1.006 m), result of freezeup.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 244 ft<sup>3</sup>/s (6.91 m<sup>3</sup>/s) Aug. 23, gage height, 6.30 ft (1.920 m); minimum, 42 ft<sup>3</sup>/s (1.19 m<sup>3</sup>/s) Aug. 15; minimum gage height, 3.82 ft (1.164 m) Mar. 17.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	82	69	60	52	60	66	71	92	85	65	57	77
2	77	70	60	50	60	68	67	88	80	70	58	42
3	74	76	58	50	60	66	67	85	76	68	57	148
4	74	76	58	50	60	66	77	84	74	64	55	41
5	76	73	58	50	62	66	85	82	71	64	52	75
6	72	70	58	50	62	66	100	79	69	67	51	70
7	71	83	58	50	62	67	113	78	69	71	50	66
8	100	93	60	50	63	67	117	79	71	71	50	45
9	126	91	60	50	62	65	116	98	67	63	49	65
10	115	84	60	52	62	64	125	95	66	61	47	65
11	122	83	60	52	63	66	136	87	72	58	47	64
12	121	78	60	52	62	66	133	87	82	58	48	72
13	108	76	61	52	63	66	139	84	72	60	51	82
14	97	75	60	54	64	66	123	122	65	56	46	46
15	89	75	60	54	64	64	109	123	65	55	56	90
16	83	77	61	54	65	62	110	104	66	53	95	75
17	81	75	63	54	66	59	117	94	75	52	72	68
18	83	72	67	56	66	62	127	88	70	60	69	66
19	82	69	67	56	66	60	141	83	64	63	72	68
20	80	74	66	56	66	59	156	81	62	58	63	67
21	79	79	68	56	66	61	140	77	63	56	57	65
22	74	66	67	58	64	61	126	74	61	64	54	62
23	71	64	64	58	63	60	120	73	59	73	204	61
24	71	62	65	58	62	59	119	72	60	62	199	60
25	72	59	64	58	63	59	118	73	61	65	122	56
26	70	61	62	58	64	60	113	78	62	68	88	57
27	69	58	60	58	65	63	109	80	60	59	102	77
28	68	59	60	58	66	67	105	114	58	55	185	67
29	67	59	59	58	---	66	101	105	62	55	167	75
30	67	59	55	58	---	68	98	101	61	53	106	75
31	67	---	54	60	---	68	---	90	---	54	85	---
TOTAL	2588	2169	1893	1682	1771	1983	3378	2750	2028	1901	2514	2207
MEAN	83.5	72.3	61.1	54.3	63.3	64.0	113	88.7	67.6	61.3	81.1	73.6
MAX	126	93	68	60	66	68	156	123	85	73	204	138
MIN	67	58	54	50	60	59	67	72	58	52	46	56

CAL YR 1977 TOTAL 26587 MEAN 72.8 MAX 210 MIN 45  
WTR YR 1978 TOTAL 26864 MEAN 73.6 MAX 204 MIN 46



## STREAMS TRIBUTARY TO LAKE MICHIGAN

121

04061000 BRULE RIVER NEAR FLORENCE, WI

LOCATION.--Lat 45°57'31", long 88°15'57", in SE¼ SE¼ sec.11, T.41 N., R.32 W., Michigan meridian, Iron County, Hydrologic Unit 04030106, on left bank 40 ft (12 m) upstream from highway bridge, 1.0 mi (1.6 km) upstream from Paint River, 2.5 mi (4.0 km) north of Florence, and 5.0 mi (8.0 km) upstream from confluence with Michigamme River.

DRAINAGE AREA.--389 mi<sup>2</sup> (1,008 km<sup>2</sup>).

PERIOD OF RECORD.--January 1914 to February 1916, June 1944 to current year.

REVISED RECORDS.--WSP 1387: 1914-16. WSP 1911: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 1,200.55 ft (365.928 m) National Geodetic Vertical Datum of 1929 (levels by Owen Ayres Associates). Prior to Aug. 29, 1944, nonrecording gage at bridge 40 ft (12 m) downstream at same datum.

REMARKS.--Records good except those for the winter period, which are fair. Discharge includes some mine pumpage (station 04060500). Several observations of water temperature were made during the year.

AVERAGE DISCHARGE.--35 years (water years 1915, 1945-78), 356 ft<sup>3</sup>/s (10.08 m<sup>3</sup>/s), 12.43 in/yr (316 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 4,700 ft<sup>3</sup>/s (133 m<sup>3</sup>/s) July 2, 1953, gage height, 6.57 ft (2.003 m); maximum gage height, 8.27 ft (2.521 m) Dec. 26, 1969, backwater from ice; minimum discharge, 118 ft<sup>3</sup>/s (3.34 m<sup>3</sup>/s) Dec. 2, 1963 (discharge measurement); minimum gage height, 1.79 ft (0.546 m) July 24, 1964.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 829 ft<sup>3</sup>/s (23.5 m<sup>3</sup>/s) Aug. 24, gage height, 3.12 ft (0.951 m); maximum gage height, 8.02 ft (2.444 m) Dec. 11, backwater from ice; minimum discharge, 167 ft<sup>3</sup>/s (4.73 m<sup>3</sup>/s) Aug. 15, gage height, 1.82 ft (0.555 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	341	266	235	250	225	205	300	356	363	262	211	345
2	325	270	235	245	220	200	260	333	333	273	223	341
3	300	295	230	240	220	200	270	319	312	279	230	401
4	285	324	230	240	220	200	291	312	301	265	227	362
5	282	302	230	235	220	195	312	313	284	248	216	313
6	275	287	230	235	215	195	358	301	267	250	204	284
7	271	300	230	235	215	195	405	290	258	287	197	264
8	336	370	230	230	215	190	406	296	268	312	191	274
9	489	377	230	230	215	190	404	372	254	265	184	260
10	490	375	235	230	215	200	443	401	243	242	180	250
11	462	351	240	225	210	205	502	367	262	230	186	244
12	473	333	240	225	210	205	490	359	547	222	182	250
13	444	312	250	225	210	205	490	343	441	225	178	285
14	404	300	250	225	210	200	465	455	339	219	175	376
15	371	297	260	225	205	200	425	528	303	216	183	407
16	347	296	270	225	205	200	423	457	292	209	353	350
17	327	293	280	225	205	195	439	400	297	207	410	307
18	331	284	295	225	205	190	484	365	350	240	366	295
19	335	277	290	225	205	190	536	348	335	282	361	324
20	319	292	295	225	210	200	602	328	313	249	309	305
21	309	300	290	225	210	210	558	312	279	232	265	289
22	296	250	285	225	210	210	507	288	259	241	257	273
23	286	240	280	225	210	220	482	276	243	317	539	258
24	280	230	270	225	210	220	484	268	234	290	811	250
25	279	225	260	225	210	230	477	262	232	259	683	237
26	277	220	255	225	205	240	460	288	235	276	539	236
27	274	225	250	225	205	250	444	309	229	261	489	273
28	269	230	250	225	205	270	421	410	223	231	692	279
29	268	240	250	225	---	300	408	438	233	222	651	321
30	264	240	250	225	---	320	384	454	271	216	538	367
31	262	---	250	225	---	310	---	403	---	211	431	---
TOTAL	10271	8601	7865	7095	5920	5740	12930	10951	8800	7738	10661	9040
MEAN	331	287	254	229	211	217	431	353	293	250	344	301
MAX	490	377	295	250	225	320	502	528	547	317	811	407
MIN	262	220	230	225	205	190	260	262	223	207	175	236
CFSM	.85	.74	.65	.59	.54	.56	1.11	.91	.75	.64	.88	.77
IN.	.98	.82	.75	.68	.57	.64	1.24	1.05	.84	.74	1.02	.86
CAL YR 1977 TOTAL	104912	104912	MEAN 287	MAX 815	MIN 157	CFSM .74	IN 10.03					
WTR YR 1978 TOTAL	105612	105612	MEAN 292	MAX 811	MIN 175	CFSM .75	IN 10.20					

## STREAMS TRIBUTARY TO LAKE MICHIGAN

04061500 PAINT RIVER AT CRYSTAL FALLS, MI

LOCATION.--Lat 46°06'21", long 88°20'05", in SE¼ sec.20, T.43 N., R.32 W., Iron County, Hydrologic Unit 04030106, on right bank 150 ft (46 m) downstream from municipal powerplant at Crystal Falls, and 14.5 mi (23.3 km) upstream from mouth.

DRAINAGE AREA.--597 mi<sup>2</sup> (1,546 km<sup>2</sup>).

PERIOD OF RECORD.--August 1944 to current year.

REVISED RECORDS.--WSP 1174: 1947-48(m). WSP 1911: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 1,306.1 ft (398.1 m) Wisconsin Electric Power Co. datum.

REMARKS.--Records good except those for the winter period, which are fair. Diurnal fluctuation caused by powerplant immediately upstream; since storage capacity is small, daily flows are not affected appreciably. Several observations of water temperature were made during the year.

AVERAGE DISCHARGE.--34 years, 585 ft<sup>3</sup>/s (16.57 m<sup>3</sup>/s), 13.31 in/yr (338 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 10,900 ft<sup>3</sup>/s (309 m<sup>3</sup>/s) Apr. 25, 1960, gage height, 9.82 ft (2.993 m); minimum, 7.7 ft<sup>3</sup>/s (0.22 m<sup>3</sup>/s) Sept. 17, 1950, gage height, 0.89 ft (0.271 m); minimum daily, 81 ft<sup>3</sup>/s (2.29 m<sup>3</sup>/s) Nov. 1, 1947.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 2,240 ft<sup>3</sup>/s (63.4 m<sup>3</sup>/s) Aug. 24, gage height, 4.47 ft (1.362 m); minimum, 160 ft<sup>3</sup>/s (4.53 m<sup>3</sup>/s) Aug. 14, gage height, 1.91 ft (0.582 m); minimum daily, 203 ft<sup>3</sup>/s (5.75 m<sup>3</sup>/s) Aug. 14.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	787	392	420	332	275	270	355	1320	983	311	328	970
2	730	401	400	327	270	263	359	1160	905	322	335	796
3	654	414	350	316	270	266	345	1010	824	318	386	714
4	580	425	320	313	265	274	368	889	759	301	394	541
5	537	409	340	313	265	278	449	814	674	290	385	573
6	492	391	350	300	270	268	567	756	580	287	359	510
7	470	410	350	290	270	271	637	704	531	335	336	478
8	530	672	340	280	270	267	702	656	521	359	299	444
9	730	772	330	275	275	267	759	691	507	386	283	422
10	865	784	320	270	280	268	836	745	480	394	265	406
11	914	755	320	270	280	274	867	766	500	381	247	405
12	1090	717	330	265	275	270	893	760	550	369	237	441
13	1160	641	330	265	270	282	944	735	520	364	235	534
14	1070	610	330	265	275	272	936	772	487	347	203	524
15	933	578	330	265	270	273	851	914	455	303	231	733
16	830	557	342	260	270	272	850	884	437	296	455	732
17	765	556	351	260	270	273	985	811	428	273	663	645
18	720	529	380	260	265	264	1210	750	436	284	584	519
19	688	521	393	260	265	261	1450	688	430	373	674	558
20	641	520	409	260	265	274	1590	606	436	455	684	534
21	597	559	414	260	265	263	1510	560	457	476	557	503
22	559	423	409	260	260	267	1390	519	448	452	454	476
23	520	525	397	260	260	275	1380	479	416	512	933	441
24	485	455	387	260	260	279	1480	447	385	555	1940	415
25	468	391	359	260	270	281	1580	425	366	519	2020	345
26	453	419	335	260	270	299	1650	458	357	526	1560	353
27	443	380	342	260	270	276	1670	519	335	485	1330	426
28	434	400	344	265	270	305	1660	698	317	442	1690	429
29	426	435	342	265	---	316	1610	925	314	399	1960	440
30	412	410	340	265	---	335	1490	996	305	366	1590	442
31	400	---	334	265	---	337	---	1020	---	346	1230	---
TOTAL	20383	15451	11038	8526	7540	8640	31373	23477	15143	11826	22847	16149
MEAN	658	515	356	275	269	279	1046	757	505	381	737	538
MAX	1160	784	420	332	280	337	1670	1320	983	555	2020	970
MIN	400	380	320	260	260	261	345	425	305	273	203	343
CFSM	1.10	.85	.60	.46	.45	.47	1.75	1.27	.85	.64	1.24	.90
IN.	1.27	.96	.69	.53	.47	.54	1.95	1.46	.94	.74	1.42	1.01
CAL YR 1977	TOTAL	177825	MEAN 487	MAX 2600	MIN 157	CFSM .82	IN 11.08					
WTR YR 1978	TOTAL	192393	MEAN 527	MAX 2020	MIN 203	CFSM .88	IN 11.99					

STREAMS TRIBUTARY TO LAKE MICHIGAN

123

04062000 PAINT RIVER NEAR ALPHA, MI

LOCATION.--Lat 46°00'40", long 88°15'30", in NW¼ NW¼ sec.25, T.42 N., R.32 W., Iron County, Hydrologic Unit 04030106, on right bank 0.6 mi (1.0 km) downstream from Lower Paint Dam, 5.5 mi (8.8 km) upstream from Brule River, and 6.0 mi (9.7 km) southeast of Alpha.

DRAINAGE AREA.--631 mi<sup>2</sup> (1,634 km<sup>2</sup>).

PERIOD OF RECORD.--June 1952 to current year. Monthly discharge only for period October 1953 to September 1960, published in WSP 1727.

REVISED RECORDS.--WSP 1727: Drainage area.

GAGE.--Water-stage recorder. Altitude of gage is 1,260 ft (384 m) from topographic map (nearest 10 ft).

REMARKS.--Records good. Flow completely regulated by powerplant and Lower Paint Dam, 0.6 mi (1.0 km) above station. Records not adjusted for diversion to Michigamme River by Paint River diversion canal. Several observations of water temperature were made during the year.

AVERAGE DISCHARGE.--26 years, 168 ft<sup>3</sup>/s (4.758 m<sup>3</sup>/s).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 8,050 ft<sup>3</sup>/s (228 m<sup>3</sup>/s) July 2, 1953, gage height, 10.50 ft (3.200 m); minimum daily, 62 ft<sup>3</sup>/s (1.76 m<sup>3</sup>/s) Mar. 22, 1963.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 1,220 ft<sup>3</sup>/s (34.6 m<sup>3</sup>/s) Aug. 27, 28, gage height, 5.17 ft (1.576 m); minimum daily, 83 ft<sup>3</sup>/s (2.35 m<sup>3</sup>/s) June 10; minimum gage height, 2.74 ft (0.835 m) Apr. 16.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	92	91	88	88	88	90	91	87	90	95	95	92
2	92	91	88	88	88	90	104	90	90	95	95	93
3	92	92	88	88	88	90	95	90	90	95	95	92
4	93	92	88	88	88	90	90	89	90	95	95	91
5	92	92	88	88	88	90	103	88	89	95	96	90
6	92	92	88	88	88	90	91	88	88	95	96	90
7	92	92	88	88	88	90	92	88	88	95	97	90
8	93	92	88	88	88	90	97	89	89	93	97	90
9	93	92	88	88	88	90	92	90	87	93	97	90
10	93	97	88	88	88	90	91	90	83	102	97	90
11	95	92	88	88	88	90	92	90	85	93	97	90
12	94	92	88	88	88	90	92	89	91	93	97	90
13	94	92	88	88	88	90	92	89	97	93	97	90
14	92	91	88	88	88	90	90	90	92	93	97	357
15	92	92	88	88	88	90	90	90	93	93	98	610
16	91	92	88	88	88	90	90	90	92	93	97	510
17	92	92	88	88	88	90	90	90	93	93	97	600
18	92	90	88	88	88	90	90	90	92	93	97	900
19	91	90	88	88	88	90	91	90	92	93	97	1040
20	91	91	88	88	88	90	91	89	94	93	97	555
21	92	92	88	88	88	90	90	90	94	93	97	88
22	92	91	88	88	88	90	90	89	95	93	97	88
23	92	90	88	88	88	90	90	88	95	93	330	88
24	92	91	88	88	88	90	90	88	95	93	385	46
25	92	90	88	88	88	90	90	88	95	93	95	86
26	92	90	88	88	88	90	90	88	95	93	426	86
27	92	90	88	88	88	92	90	90	95	93	762	86
28	92	90	88	88	88	92	90	92	95	93	1220	96
29	92	90	88	88	---	92	90	92	95	93	902	88
30	91	90	88	88	---	92	89	93	95	93	329	87
31	91	---	88	88	---	93	---	91	---	93	93	---
TOTAL	2858	2740	2728	2728	2464	2801	2753	2775	2754	2906	6667	6619
MEAN	92.2	91.3	88.0	88.0	88.0	90.4	91.8	89.5	91.8	93.7	215	221
MAX	95	97	88	88	88	93	104	93	97	102	1220	1040
MIN	91	90	88	88	88	90	89	87	83	93	93	86

CAL YR 1977 TOTAL 39249 MEAN 108 MAX 1120 MIN 86  
WTR YR 1978 TOTAL 40793 MEAN 112 MAX 1220 MIN 83

## STREAMS TRIBUTARY TO LAKE MICHIGAN

04062200 PESHEKEE RIVER NEAR CHAMPION, MI

LOCATION.--Lat 46°33'25", long 88°00'09", in NW¼ sec.13, T.48 N., R.30 W., Marquette County, Hydrologic Unit 04030107, on left bank 10 ft (3 m) downstream from bridge on County Road 607, 0.6 mi (1.0 km) downstream from West Branch, and 3.5 mi (5.6 km) northwest of Champion.

DRAINAGE AREA.--133 mi<sup>2</sup> (344 km<sup>2</sup>).

## WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--July 1961 to September 1978 (discontinued as a continuous-record station; converted to a crest-stage partial-record station).

GAGE.--Water-stage recorder. Datum of gage is 1,557.49 ft (474.723 m) National Geodetic Vertical Datum of 1929. Prior to Aug. 15, 1961, nonrecording gage at same site and datum.

REMARKS.--Water-discharge records good except those for the winter period, which are fair.

AVERAGE DISCHARGE.--17 years, 211 ft<sup>3</sup>/s (5.976 m<sup>3</sup>/s), 21.54 in/yr (547 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 3,610 ft<sup>3</sup>/s (102 m<sup>3</sup>/s) May 8, 1965, gage height, 8.01 ft (2.441 m); minimum, 0.70 ft<sup>3</sup>/s (0.020 m<sup>3</sup>/s) Sept. 7, 8, 9, 10, 11, 1976, gage height, 1.10 ft (0.335 m).

EXTREMES FOR CURRENT YEAR.--Peak discharges above base of 600 ft<sup>3</sup>/s (17.0 m<sup>3</sup>/s) and maximum (\*):

Date	Time	Discharge (ft <sup>3</sup> /s) (m <sup>3</sup> /s)	Gage height (ft) (m)	Date	Time	Discharge (ft <sup>3</sup> /s) (m <sup>3</sup> /s)	Gage height (ft) (m)
Apr. 29	1100	2,050 58.1	5.93 1.807	Aug. 28	2000	829 23.5	4.24 1.292
May 15	0900	1,420 40.2	5.09 1.551	Sept. 12	0900	*2,770 78.4	*6.89 2.100
Aug. 25	1200	641 18.2	3.88 1.183				

Minimum discharge, 26 ft<sup>3</sup>/s (0.736 m<sup>3</sup>/s) Aug. 15, gage height, 1.56 ft (0.475 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	247	117	140	105	62	44	70	1480	281	60	128	385
2	213	121	145	100	62	44	72	1180	250	55	144	292
3	181	125	145	98	62	44	76	1020	217	49	182	234
4	158	120	140	96	62	43	86	1000	188	44	176	190
5	141	112	135	94	62	43	110	1040	175	40	146	158
6	130	105	125	92	62	43	115	1010	158	38	115	145
7	124	109	125	90	62	43	140	924	140	41	92	131
8	200	146	130	88	62	43	150	865	151	112	75	115
9	387	174	130	88	62	43	160	907	159	176	63	104
10	451	182	130	88	62	42	165	906	149	176	52	96
11	502	182	130	88	62	42	175	845	142	147	44	873
12	556	169	130	88	60	42	185	1070	176	114	39	2660
13	557	154	130	88	58	42	190	1150	174	97	33	2130
14	503	145	130	88	56	42	170	1170	146	88	29	1410
15	436	138	130	86	56	42	190	1370	126	124	29	1020
16	389	147	130	84	54	42	225	1090	123	139	82	763
17	345	158	130	84	52	42	270	795	134	141	105	584
18	331	167	135	82	50	42	320	610	218	165	105	453
19	299	170	135	80	50	42	310	482	203	217	121	375
20	265	180	140	78	48	42	300	401	167	333	158	328
21	235	259	140	76	48	43	330	351	154	308	160	285
22	208	260	135	74	47	43	409	304	138	269	129	245
23	184	220	135	72	46	43	480	260	115	303	240	211
24	169	200	135	70	45	44	626	223	101	276	542	180
25	158	180	130	68	45	45	852	195	94	252	633	155
26	148	175	125	66	45	47	1150	181	100	226	573	140
27	141	170	120	64	45	49	1430	168	110	192	453	188
28	138	160	120	64	45	52	1680	188	98	159	761	197
29	132	150	115	64	---	56	1990	228	84	173	769	212
30	124	145	110	64	---	60	1840	262	70	169	665	244
31	120	---	105	62	---	66	---	285	---	150	522	---
TOTAL	8172	4840	4035	2529	1532	1400	14266	21960	4541	4833	7365	14503
MEAN	264	161	130	81.6	54.7	45.2	476	708	151	156	238	483
MAX	557	260	145	105	62	66	1990	1480	281	333	769	2660
MIN	120	105	105	62	45	42	70	168	70	38	29	96
CFSM	1.99	1.21	.98	.61	.41	.34	3.58	5.32	1.14	1.17	1.79	3.63
IN.	2.29	1.35	1.13	.71	.43	.39	3.99	6.14	1.27	1.35	2.06	4.06
CAL YR 1977 TOTAL	66039		MEAN 181	MAX 2120	MIN 10	CFSM 1.36	IN 18.47					
WTR YR 1978 TOTAL	89976		MEAN 247	MAX 2660	MIN 29	CFSM 1.86	IN 25.17					

STREAMS TRIBUTARY TO LAKE MICHIGAN  
04062200 PESHEKEE RIVER NEAR CHAMPION, MI--CONTINUED

125

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water year 1961 to September 1978 (discontinued).

PERIOD OF DAILY RECORD.--

WATER TEMPERATURES: August 1961 to September 1978.

INSTRUMENTATION.--Temperature recorder since Aug. 29, 1961.

REMARKS.--Complete ice cover during winter period. Unpublished water temperatures for water year 1963 are available in the Escanaba subdistrict office.

EXTREMES FOR PERIOD OF DAILY RECORD.--

WATER TEMPERATURES (water years 1961, 1962, 1964-78): Maximum, 28.5°C July 1, 1966; minimum, 0.0°C on many days during winter periods.

EXTREMES FOR CURRENT YEAR.--

WATER TEMPERATURES: Maximum, 25.5°C Aug. 14; minimum, 0.0°C on many days during winter period.

TEMPERATURE (DEG. C) OF WATER, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DAY	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN
	OCTOBER		NOVEMBER		DECEMBER		JANUARY		FEBRUARY		MARCH	
1	11.0	10.0	7.5	7.0	1.0	1.0	.0	.0	.0	.0	.0	.0
2	10.5	9.5	7.5	7.0	1.5	1.0	.0	.0	.0	.0	.0	.0
3	9.5	9.0	8.0	7.5	2.0	1.5	.0	.0	.0	.0	.0	.0
4	9.5	8.5	7.5	6.5	2.0	2.0	.0	.0	.0	.0	.0	.0
5	9.5	8.5	6.5	6.0	2.0	2.0	.0	.0	.0	.0	.0	.0
6	9.0	8.0	6.0	5.5	2.0	2.0	.0	.0	.0	.0	.0	.0
7	9.0	7.5	6.5	6.0	2.0	2.0	.0	.0	.0	.0	.0	.0
8	7.5	7.5	7.5	6.5	2.0	2.0	.0	.0	.0	.0	.0	.0
9	7.5	7.5	9.0	7.5	2.0	2.0	.0	.0	.0	.0	.0	.0
10	7.5	7.0	8.5	7.5	2.0	1.5	.0	.0	.0	.0	.0	.0
11	7.5	7.0	7.5	5.0	1.5	1.5	.0	.0	.0	.0	.0	.0
12	7.0	6.5	5.0	4.0	1.5	1.0	.0	.0	.0	.0	.0	.0
13	6.5	6.0	4.0	3.5	1.0	1.0	.0	.0	.0	.0	.0	.0
14	6.5	6.0	3.5	3.5	1.0	.0	.0	.0	.0	.0	.0	.0
15	6.5	6.5	3.5	3.0	.0	.0	.0	.0	.0	.0	.0	.0
16	6.5	6.5	3.0	3.0	.0	.0	.0	.0	.0	.0	.0	.0
17	6.5	6.0	3.0	2.5	.0	.0	.0	.0	.0	.0	.0	.0
18	6.5	6.5	2.5	2.0	.0	.0	.0	.0	.0	.0	.0	.0
19	7.5	7.0	2.0	2.0	.0	.0	.0	.0	.0	.0	.0	.0
20	7.5	6.5	2.5	2.0	.0	.0	.0	.0	.0	.0	.0	.0
21	7.5	7.0	2.5	2.0	.0	.0	.0	.0	.0	.0	.0	.0
22	7.5	6.5	2.0	2.0	.0	.0	.0	.0	.0	.0	.0	.0
23	7.0	6.0	2.0	2.0	.0	.0	.0	.0	.0	.0	.0	.0
24	7.0	6.0	1.5	1.5	.0	.0	.0	.0	.0	.0	.0	.0
25	8.0	6.5	1.5	1.5	.0	.0	.0	.0	.0	.0	.0	.0
26	8.0	7.5	1.5	1.5	.0	.0	.0	.0	.0	.0	.0	.0
27	8.0	7.5	1.5	1.5	.0	.0	.0	.0	.0	.0	.0	.0
28	7.5	6.5	1.5	1.5	.0	.0	.0	.0	.0	.0	.0	.0
29	6.5	6.0	1.5	1.0	.0	.0	.0	.0	---	---	.0	.0
30	6.5	6.5	1.5	1.0	.0	.0	.0	.0	---	---	.0	.0
31	7.0	6.5	---	---	.0	.0	.0	.0	---	---	.0	.0
MONTH	11.0	6.0	9.0	1.0	2.0	.0	.0	.0	.0	.0	.0	.0



STREAMS TRIBUTARY TO LAKE MICHIGAN  
04062200 PESHEKEE RIVER NEAR CHAMPION, MI--CONTINUED

TEMPERATURE (DEG. C) OF WATER, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DAY	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN
	APRIL		MAY		JUNE		JULY		AUGUST		SEPTEMBER	
1	.0	.0	6.5	5.0	16.5	14.5	20.0	18.5	20.0	17.5	16.0	15.0
2	.0	.0	7.0	6.0	15.0	14.0	18.5	17.0	20.0	19.0	17.5	15.5
3	1.0	.0	7.5	7.0	14.5	13.0	20.5	17.0	20.0	18.0	17.5	16.5
4	1.0	1.0	8.5	7.0	14.5	13.5	20.5	18.0	19.0	17.0	18.5	16.5
5	1.0	1.0	9.0	8.0	14.5	12.0	21.5	18.5	19.0	18.5	18.5	17.5
6	1.0	1.0	9.5	8.0	16.5	14.0	22.5	20.5	20.0	19.5	19.0	16.5
7	1.0	1.0	10.5	8.5	16.5	13.0	20.5	20.5	21.0	19.5	19.0	18.0
8	1.0	1.0	10.5	10.0	14.0	11.0	21.0	18.0	21.0	21.0	18.0	17.0
9	1.0	1.0	10.0	9.0	15.0	12.5	21.0	18.0	22.5	20.0	17.0	17.0
10	1.0	1.0	10.0	8.0	15.0	13.0	18.0	17.0	22.0	19.0	19.0	17.0
11	1.0	1.0	12.0	10.0	14.5	14.5	19.0	16.0	22.0	19.0	18.5	15.5
12	1.0	1.0	12.0	10.0	14.5	13.5	19.0	17.0	23.0	20.0	15.5	13.5
13	1.0	1.0	10.0	8.0	14.0	11.5	19.0	18.0	20.0	20.5	13.5	12.5
14	1.0	1.0	8.0	7.0	16.0	12.0	20.0	16.5	25.5	22.5	12.5	12.5
15	1.0	1.0	9.0	7.0	15.0	13.0	19.5	18.0	25.0	23.0	12.5	12.5
16	2.0	1.0	12.0	9.5	16.0	14.0	20.5	17.5	23.5	21.5	12.5	11.5
17	2.0	2.0	13.5	12.0	16.0	15.0	22.0	19.5	22.5	20.5	12.0	11.5
18	2.0	2.0	15.0	13.0	17.0	15.0	21.5	21.0	22.0	21.0	12.0	12.0
19	2.0	2.0	15.5	14.0	17.0	15.0	21.5	20.0	21.0	20.0	12.0	11.5
20	2.0	2.0	15.5	13.5	17.5	16.5	21.5	19.5	20.0	18.0	12.0	12.0
21	2.5	2.0	13.5	11.5	16.5	15.0	19.5	18.5	20.0	18.5	12.0	12.0
22	3.0	2.0	14.0	12.0	16.5	13.5	19.0	18.0	19.5	19.0	12.0	10.0
23	2.5	2.0	15.5	13.0	16.5	14.5	18.0	17.0	19.5	17.5	12.0	10.5
24	4.0	2.5	16.5	14.0	16.5	15.5	20.0	18.0	17.5	16.5	12.5	11.5
25	3.5	2.5	16.5	15.0	18.0	16.0	20.5	19.0	17.0	16.5	11.5	10.5
26	3.0	2.5	18.5	15.5	20.0	17.5	21.0	20.0	17.5	16.5	12.0	11.0
27	3.5	2.5	19.0	17.5	20.0	18.0	21.0	19.5	17.5	17.5	12.0	10.5
28	6.0	4.0	19.5	18.0	20.0	17.5	20.5	18.5	17.0	16.5	10.5	9.5
29	6.0	5.0	19.5	17.5	21.0	18.5	19.5	18.5	16.5	16.0	10.0	8.5
30	6.0	5.0	19.5	18.0	20.0	18.0	19.0	16.5	16.0	15.5	9.5	9.5
31	---	---	18.5	16.5	---	---	18.5	17.5	16.0	15.0	---	---
MONTH	6.0	.0	19.5	5.0	21.0	11.0	22.5	16.0	25.5	15.0	19.0	8.5

## STREAMS TRIBUTARY TO LAKE MICHIGAN

127

04062230 MICHIGAMME RIVER NEAR MICHIGAMME, MI

LOCATION.--Lat 46°28'00", long 88°04'28", in SW¼ SW¼ sec.16, T.47 N., R.30 W., Marquette County, Hydrologic Unit 04030107, on right bank 20 ft (6 m) upstream from Northern Natural Gas Co. pipeline, 0.6 mi (1.0 km) upstream from Spruce River, 1.2 mi (1.9 km) downstream from Lake Michigamme, and 5.0 mi (8.0 km) southeast of Michigamme.

DRAINAGE AREA.--194 mi<sup>2</sup> (502 km<sup>2</sup>).

## WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--October 1968 to current year.

GAGE.--Water-stage recorder. Altitude of gage is 1,520 ft (463 m) from topographic map (nearest 10 ft).

REMARKS.--Water-discharge records good except those for period of no gage-height record Nov. 8 to Dec. 7, which are fair.

AVERAGE DISCHARGE.--10 years, 282 ft<sup>3</sup>/s (7.986 m<sup>3</sup>/s), 19.74 in/yr (501 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 3,180 ft<sup>3</sup>/s (90.1 m<sup>3</sup>/s) Apr. 19, 1976, gage height, 7.77 ft (2.368 m); minimum, 2.8 ft<sup>3</sup>/s (0.079 m<sup>3</sup>/s) Sept. 30, 1976, gage height, 1.56 ft (0.475 m).

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 1,520 ft<sup>3</sup>/s (43.0 m<sup>3</sup>/s) May 1, gage height, 6.21 ft (1.893 m); minimum, 80 ft<sup>3</sup>/s (2.27 m<sup>3</sup>/s) Mar. 29-31, gage height, 2.93 ft (0.893 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	278	262	235	172	115	92	83	1500	378	171	223	650
2	278	255	230	168	117	91	84	1480	370	160	222	603
3	272	250	230	164	116	91	87	1420	356	151	219	549
4	268	243	230	160	114	91	92	1350	341	142	215	483
5	261	233	225	157	115	90	95	1310	325	131	211	434
6	252	226	220	156	115	88	101	1270	307	128	206	394
7	242	222	215	156	115	88	112	1230	299	128	196	358
8	255	220	206	156	112	86	119	1190	290	130	186	327
9	272	220	206	158	111	85	134	1170	281	128	176	303
10	294	215	204	154	108	84	157	1150	259	131	167	293
11	334	210	199	150	108	84	174	1120	256	132	153	471
12	393	210	197	147	107	83	191	1130	263	130	143	935
13	437	210	193	144	106	83	214	1160	257	131	137	1220
14	478	205	189	142	104	83	230	1180	250	131	125	1340
15	499	205	184	141	102	83	241	1220	242	140	122	1330
16	497	210	180	139	101	83	251	1240	240	135	138	1260
17	490	210	177	137	101	83	261	1200	241	134	136	1170
18	487	220	178	135	100	82	277	1120	255	151	135	1060
19	471	225	188	132	99	82	300	1020	257	163	138	957
20	452	230	188	131	98	81	327	929	255	193	138	868
21	433	235	190	128	98	81	346	829	253	212	139	769
22	410	240	190	125	95	83	366	740	247	228	142	672
23	382	245	188	123	95	83	402	658	238	247	191	585
24	361	250	188	121	94	83	464	581	230	254	250	516
25	340	250	191	119	94	83	567	511	223	260	297	449
26	323	245	189	127	94	82	712	463	217	268	352	399
27	309	245	187	127	93	81	875	428	209	263	414	387
28	299	240	182	124	93	81	1050	404	200	251	553	362
29	288	240	179	122	---	80	1240	388	193	249	650	354
30	278	235	176	120	---	80	1420	389	181	238	694	355
31	266	---	174	117	---	81	---	387	---	231	691	---
TOTAL	10899	6906	6108	4352	2920	2611	10972	30167	7913	5541	7759	19853
MEAN	352	230	197	140	104	84.2	366	973	264	179	250	662
MAX	499	262	235	172	117	92	1420	1500	378	268	694	1340
MIN	242	205	174	117	93	80	83	387	181	128	122	293
CFSM	1.81	1.19	1.02	.72	.54	.43	1.89	5.02	1.36	.92	1.29	3.41
IN.	2.09	1.32	1.17	.83	.56	.50	2.10	5.78	1.52	1.06	1.49	3.81

CAL YR 1977 TOTAL 81965 MEAN 225 MAX 1920 MIN 13 CFSM 1.16 IN 15.72  
WTR YR 1978 TOTAL 116001 MEAN 318 MAX 1500 MIN 80 CFSM 1.64 IN 22.24

## STREAMS TRIBUTARY TO LAKE MICHIGAN

04062230 MICHIGAMME RIVER NEAR MICHIGAMME, MI--CONTINUED

## WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1970 to current year.

## WATER QUALITY DATA. WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DATE	TIME	STREAM- FLOW, INSTAN- TANEOUS (CFS)	SPF- CIFIC CON- DUCT- ANCE (MICRO- MHOS)	PH (UNITS)	TEMPER- ATURE, AIR (DEG C)	TEMPER- ATURE (DEG C)	COLOR (PLAT- INUM- CORAL UNITS)	TUR- BID- ITY (JTU)	HARD- NESS (MG/L AS CaCO3)
OCT									
12...	1100	402	60	7.1	1.5	9.0	41	0	19
NOV									
08...	1545	216	52	7.3	14.0	9.0	60	1	20
DEC									
07...	0950	211	60	7.4	-13.0	1.0	50	1	22
JAN									
12...	1215	142	65	6.3	<-5.0	.0	80	2	24
FEB									
22...	1015	96	60	6.7	-16.0	.5	60	3	23
MAR									
23...	1000	83	55	6.8	.5	.5	70	1	21
MAY									
18...	0900	1140	55	7.3	20.0	11.5	70	2	19
31...	1015	382	44	6.6	15.5	14.0	80	1	19
JUN									
07...	0900	298	47	6.9	11.5	13.0	60	2	19
JUL									
13...	0830	169	46	7.0	18.0	14.5	45	1	19
AUG									
15...	1100	124	52	7.2	25.0	22.0	35	2	20
SEP									
14...	1030	1320	52	7.0	16.0	16.5	100	2	19

DATE	CALCIUM DIS- SOLVED (MG/L AS CA)	MAGNE- SIUM, DIS- SOLVED (MG/L AS MG)	NITRO- GEN, NO2+NO3 TOTAL (MG/L AS N)	IRON, TOTAL RECOV- ERABLE (UG/L AS FE)	IRON, SUS- PENDED RECOV- ERABLE (UG/L AS FE)	IRON, DIS- SOLVED (UG/L AS FE)	MANGA- NESE, TOTAL RECOV- ERABLE (UG/L AS MN)	MANGA- NESE, SUS- PENDED RECOV. (UG/L AS MN)	MANGA- NESE, DIS- SOLVED (UG/L AS MN)
OCT									
12...	4.8	1.8	.15	220	--	120	20	20	0
NOV									
08...	5.1	1.7	.16	260	--	150	20	10	10
DEC									
07...	5.5	2.0	.18	290	--	190	20	10	10
JAN									
12...	6.6	1.8	.17	260	--	170	30	30	0
FEB									
22...	6.1	1.9	.20	310	--	260	10	10	0
MAR									
23...	5.5	1.8	.21	310	--	220	10	10	0
MAY									
18...	5.0	1.7	.19	320	--	210	40	0	40
31...	5.1	1.6	.18	410	--	160	40	30	10
JUN									
07...	4.9	1.7	.19	440	--	180	60	50	10
JUL									
13...	4.8	1.7	.16	290	--	180	20	10	10
AUG									
15...	5.2	1.8	.15	230	50	180	30	10	20
SEP									
14...	5.0	1.7	.15	340	110	230	30	20	10

## STREAMS TRIBUTARY TO LAKE MICHIGAN

129

04062400 MICHIGAMME RIVER NEAR WITCH LAKE, MI

LOCATION.--Lat 46°14'48", long 88°00'45", in NW¼ NW¼ sec.1, T.44 N., R.30 W., Dickinson County, Hydrologic Unit 04030107, on left bank 20 ft (6 m) upstream from bridge on county highway, 0.4 mi (0.6 km) upstream from Witch Lake Outlet, and 2.0 mi (3.2 km) south of Witch Lake.

DRAINAGE AREA.--316 mi<sup>2</sup> (818 km<sup>2</sup>).

## WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--August 1964 to current year.

GAGE.--Water-stage recorder. Datum of gage is 1,384.25 ft (421.919 m) National Geodetic Vertical Datum of 1929.

REMARKS.--Water-discharge records good except those for the winter period, which are fair. Occasional regulation caused by dam 14 mi (23 km) above station. Some flow diverted and returned above station by iron ore processing plant.

AVERAGE DISCHARGE.--14 years, 422 ft<sup>3</sup>/s (11.95 m<sup>3</sup>/s), 18.14 in/yr (461 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 4,360 ft<sup>3</sup>/s (123 m<sup>3</sup>/s) May 11, 1965, gage height, 11.60 ft (3.536 m); minimum, 23 ft<sup>3</sup>/s (0.65 m<sup>3</sup>/s) Nov. 15, 28, 1976; minimum gage height, 1.96 ft (0.597 m) Sept. 10, 11, 12, 13, Nov. 15, 1976.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 1,900 ft<sup>3</sup>/s (53.8 m<sup>3</sup>/s) Sept. 15, gage height, 7.23 ft (2.204 m); minimum, 108 ft<sup>3</sup>/s (3.06 m<sup>3</sup>/s) July 12, gage height, 2.59 ft (0.789 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	422	340	240	195	150	130	156	1730	583	169	243	926
2	411	343	250	190	150	130	171	1780	515	166	262	864
3	401	359	250	190	150	125	164	1760	481	173	259	791
4	388	389	240	190	150	125	166	1670	473	177	254	724
5	354	330	230	190	145	125	215	1600	451	169	249	639
6	327	314	220	190	145	120	222	1540	379	128	243	579
7	324	312	215	190	145	120	228	1500	360	128	212	523
8	388	314	220	190	145	120	241	1450	340	175	200	481
9	503	321	220	190	145	120	290	1440	320	177	198	451
10	574	339	220	185	145	120	334	1440	310	169	179	433
11	606	359	225	185	140	120	358	1400	310	142	136	616
12	609	350	225	185	135	125	358	1390	320	111	132	1400
13	647	343	230	185	135	125	355	1390	330	128	142	1690
14	686	336	241	185	135	130	351	1440	340	156	160	1720
15	714	307	254	185	135	130	390	1450	340	173	162	1860
16	732	291	262	180	135	130	408	1470	246	173	150	1750
17	649	304	257	180	135	135	448	1460	270	154	148	1590
18	658	305	254	175	135	135	519	1380	390	150	207	1480
19	701	317	246	175	135	135	539	1280	394	169	246	1340
20	673	331	233	170	135	135	575	1140	320	307	200	1240
21	581	358	230	170	135	135	612	1100	280	355	138	1130
22	559	389	225	165	135	130	616	973	293	257	144	1020
23	569	381	220	160	135	130	627	883	331	251	243	910
24	512	341	215	160	135	135	695	755	307	394	440	803
25	456	325	210	160	135	135	827	728	238	372	587	716
26	453	300	210	155	130	140	953	635	233	351	531	643
27	450	285	205	155	130	140	1130	466	257	365	511	571
28	443	270	205	155	130	144	1250	679	249	348	803	559
29	404	260	200	150	---	166	1420	515	220	320	996	604
30	388	250	200	150	---	160	1590	523	190	300	1030	583
31	372	---	195	150	---	148	---	620	---	254	969	---
TOTAL	15954	9763	7047	5435	3890	4098	16208	37587	10070	6861	10374	28636
MEAN	515	325	227	175	139	132	540	1212	336	221	335	955
MAX	732	389	262	195	150	166	1590	1780	583	394	1030	1860
MIN	324	250	195	150	130	120	156	466	190	111	132	433
CFSM	1.63	1.03	.72	.55	.44	.42	1.71	3.84	1.06	.70	1.06	3.02
IN.	1.88	1.15	.83	.64	.46	.48	1.91	4.42	1.19	.81	1.22	3.37
CAL YR 1977	TOTAL	117228	MEAN	321	MAX	2540	MIN	25	CFSM	1.02	IN	13.80
WTR YR 1978	TOTAL	155923	MEAN	427	MAX	1860	MIN	111	CFSM	1.35	IN	18.36

STREAMS TRIBUTARY TO LAKE MICHIGAN  
04062400 MICHIGAN RIVER NEAR WITCH LAKE, MI--CONTINUED  
WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1965 to current year.

WATER QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DATE	TIME	STREAM- FLOW, INSTAN- TANEOUS (CFS)	SPF- CIFIC CON- DUCT- ANCE (MICHO- MHOS)	PH (UNITS)	TEMPER- ATURE, AIR (DEG C)	TEMPER- ATURE (DEG C)	COLOR (PLAT- INUM- COBALT UNITS)	TUR- BID- ITY (JTU)	HARD- NESS (MG/L AS CaCO3)
OCT 12...	1230	624	90	7.3	2.0	7.0	60	1	31
NOV 08...	1345	291	--	7.3	12.5	8.0	60	2	36
DEC 07...	1130	217	90	7.2	-5.5	.0	55	1	36
JAN 11...	1400	186	115	7.4	<-5.0	.0	60	1	48
FEB 22...	1200	135	115	6.6	-3.0	.0	60	2	46
MAR 23...	1250	132	140	7.1	2.0	.0	60	2	56
MAY 18...	1030	1430	60	7.5	27.0	12.0	70	3	23
31...	1230	632	70	7.6	17.0	18.5	130	2	32
JUN 07...	1015	397	77	6.9	9.0	17.0	70	2	34
JUL 13...	1000	132	114	7.4	19.5	20.0	45	1	47
AUG 15...	1310	162	98	7.4	27.0	23.0	30	2	41
SEP 14...	1515	1680	60	7.3	19.0	16.0	200	2	26

DATE	CALCIUM DIS- SOLVED (MG/L AS CA)	MAGNE- SIUM, DIS- SOLVED (MG/L AS MG)	NITRO- GEN, NO2+NO3 TOTAL (MG/L AS N)	IRON, TOTAL RECOV- ERABLE (UG/L AS FE)	IRON, SUS- PENDED RECOV- ERABLE (UG/L AS FE)	IRON, DIS- SOLVED (UG/L AS FE)	MANGA- NESE, TOTAL RECOV- ERABLE (UG/L AS MN)	MANGA- NESE, SUS- PENDED RECOV. (UG/L AS MN)	MANGA- NESE, DIS- SOLVED (UG/L AS MN)
OCT 12...	7.6	3.0	.17	570	--	230	70	40	30
NOV 08...	8.9	3.4	.19	430	--	250	50	10	40
DEC 07...	8.8	3.4	.23	430	--	310	50	10	40
JAN 11...	11	5.1	.22	450	--	290	70	40	30
FEB 22...	11	4.4	.25	560	--	330	40	10	30
MAR 23...	13	5.6	.28	470	--	290	50	10	40
MAY 18...	5.9	2.1	.19	710	--	220	50	30	20
31...	8.3	2.8	.17	610	--	330	90	50	40
JUN 07...	8.3	3.1	.19	750	--	300	130	80	50
JUL 13...	11	4.8	.16	470	--	260	60	10	50
AUG 15...	10	3.9	.21	350	150	200	60	20	40
SEP 14...	6.5	2.4	.18	760	260	500	70	40	30



## STREAMS TRIBUTARY TO LAKE MICHIGAN

131

## 04062500 MICHIGAMME RIVER NEAR CRYSTAL FALLS, MI

LOCATION.--Lat 46°06'50", long 88°12'57", in NW¼ sec.20, T.43 N., R.31 W., Iron County, Hydrologic Unit 04030107, on right bank 400 ft (122 m) upstream from highway bridge, 5.0 mi (8.0 km) downstream from Michigamme Reservoir, 6.0 mi (9.7 km) east of Crystal Falls and 15 mi (24 km) upstream from confluence with Brule River.

DRAINAGE AREA.--656 mi<sup>2</sup> (1,699 km<sup>2</sup>).

PERIOD OF RECORD.--August 1944 to current year.

REVISED RECORDS.--WSP 1911: Drainage area.

GAGE.--Water-stage recorder. Altitude of gage is 1,300 ft (396 m) from topographic map (nearest 10 ft).

REMARKS.--Records excellent. Flow regulated by powerplant and by Michigamme Reservoir, capacity, 119,950 acre-ft (148 hm<sup>3</sup>), 5 mi (8 km) above station. Several observations of water temperature were made during the year.

AVERAGE DISCHARGE.--34 years, 693 ft<sup>3</sup>/s (19.63 m<sup>3</sup>/s).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 7,260 ft<sup>3</sup>/s (206 m<sup>3</sup>/s) Apr. 28, 1960, gage height, 10.73 ft (3.271 m); minimum daily, 71 ft<sup>3</sup>/s (2.01 m<sup>3</sup>/s) Nov. 26, 1950.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 2,660 ft<sup>3</sup>/s (75.3 m<sup>3</sup>/s) Sept. 19, gage height, 6.90 ft (2.103 m); minimum, 98 ft<sup>3</sup>/s (2.78 m<sup>3</sup>/s) Mar. 3, gage height, 1.42 ft (0.433 m); minimum daily, 121 ft<sup>3</sup>/s (3.43 m<sup>3</sup>/s) Mar. 4, Apr. 28.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	602	595	1160	1140	1060	369	455	127	623	141	648	614
2	599	595	1160	1130	1050	358	448	125	604	144	692	918
3	597	605	1160	1130	1040	249	464	124	616	134	688	1150
4	596	609	1160	1120	1030	121	294	124	612	132	686	887
5	596	606	1170	1120	1010	173	572	124	608	425	632	700
6	593	603	1170	949	1000	399	719	124	606	608	592	698
7	593	606	1170	565	989	528	370	125	609	460	638	589
8	618	612	1170	1090	976	399	145	379	608	146	672	695
9	627	615	1160	1080	964	367	150	584	455	148	670	699
10	625	328	1160	1080	854	326	150	599	149	378	670	705
11	631	151	1150	1070	538	149	153	650	157	596	515	908
12	628	147	1150	1070	537	146	157	698	491	595	146	1340
13	679	145	1140	1060	823	149	162	701	663	595	142	1920
14	713	708	1160	1060	1010	149	158	723	639	452	396	2180
15	709	1160	1190	1050	713	147	156	999	627	136	588	2160
16	706	571	1180	1050	492	151	159	1470	620	138	323	1890
17	922	157	1110	1040	488	155	166	1650	616	430	147	1570
18	1170	137	839	1030	484	160	166	1650	613	595	148	1980
19	1220	135	673	1030	479	157	136	1660	607	599	146	2500
20	1220	141	951	926	619	368	126	1410	603	600	144	2150
21	963	146	1170	605	718	472	123	1180	600	597	435	1420
22	709	142	1180	603	708	465	125	890	598	603	582	1180
23	692	139	1170	865	673	454	127	687	452	605	874	901
24	698	138	1170	1010	658	353	124	690	135	600	976	605
25	696	137	1170	1070	625	148	124	673	137	602	764	643
26	697	425	1160	940	426	152	124	636	433	599	741	701
27	628	607	1160	504	360	361	122	605	598	592	782	708
28	595	914	1150	591	353	471	121	627	599	594	1200	715
29	593	1170	1150	588	---	464	124	630	599	592	1190	723
30	593	1160	1140	867	---	460	130	637	451	590	865	724
31	594	---	1140	1060	---	458	---	630	---	592	626	---
TOTAL	22102	14204	34943	29493	20677	9278	6550	21931	15728	14018	18318	35013
MEAN	713	473	1127	951	738	299	218	707	524	452	591	1167
MAX	1220	1170	1190	1140	1060	528	719	1660	663	608	1200	2600
MIN	593	135	673	504	353	121	121	124	135	132	142	614

CAL YR 1977 TOTAL 183845 MEAN 504 MAX 2330 MIN 118  
WTR YR 1978 TOTAL 242255 MEAN 664 MAX 2600 MIN 121

## STREAMS TRIBUTARY TO LAKE MICHIGAN

04063000 MENOMINEE RIVER NEAR FLORENCE, WI

LOCATION.--Lat 45°57'04", long 88°11'13", in NE¼ sec.16, T.41 N., R.31 W., Michigan meridian, Iron County, Hydrologic Unit 04030108, on left bank 0.5 mi (0.8 km) downstream from confluence of Brule and Michigamme Rivers, 3.5 mi (5.6 km) northeast of Florence, and at mile 117 (188 km).

DRAINAGE AREA.--1,780 mi<sup>2</sup> (4,610 km<sup>2</sup>).

PERIOD OF RECORD.--January 1914 to current year. Published as "at Twin Falls near Iron Mountain, MI" 1914-57. Records published for both sites July 1950 to September 1957.

REVISED RECORDS.--WSP 1707: 1953(M). WSP 1911: Drainage area of former site.

GAGE.--Water-stage recorder. Datum of gage is 1,119.23 (341.141 m) National Geodetic Vertical Datum of 1929 (levels by Owen Ayres Associates). Prior to July 1950, headwater and tailwater gages and generation data entered hourly in daily log sheets by company employees at the Twin Falls Powerplant of Wisconsin Electric Power Co., 10.4 mi (16.7 km) downstream.

REMARKS.--Records excellent. Prior to July 1950, discharge determined from powerplant records computed on basis of load-discharge rating of hydroelectric units and rating for tailwater gage during periods of spill. Rating developed by Geological Survey. Flow regulated by powerplants, Michigamme Reservoir, capacity, 119,950 acre-ft (148 hm<sup>3</sup>), and Peavy Pond, capacity, 33,860 acre-ft (41.7 hm<sup>3</sup>), on Michigamme River, and by many smaller reservoirs above station. Several observations of water temperature were made during the year.

AVERAGE DISCHARGE.--64 years, 1,790 ft<sup>3</sup>/s (50.69 m<sup>3</sup>/s).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 19,500 ft<sup>3</sup>/s (552 m<sup>3</sup>/s) Apr. 26, 1960, gage height, 14.15 ft (4.313 m); minimum, 38 ft<sup>3</sup>/s (1.08 m<sup>3</sup>/s) Aug. 21, 1962, Sept. 26, 1975; minimum gage height, 1.18 ft (0.360 m) Aug. 21, 1962, Nov. 4, 1965; minimum daily discharge, 57 ft<sup>3</sup>/s (1.61 m<sup>3</sup>/s) Sept. 26, 1975.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 4,870 ft<sup>3</sup>/s (138 m<sup>3</sup>/s) Sept. 18, gage height, 6.76 ft (2.060 m); minimum, 250 ft<sup>3</sup>/s (7.08 m<sup>3</sup>/s) Oct. 3, Jan. 13, gage height, 1.95 ft (0.594 m); minimum daily, 630 ft<sup>3</sup>/s (17.8 m<sup>3</sup>/s) Aug. 20.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2090	1550	1480	1500	1530	1520	1310	1560	2740	844	1210	2180
2	1610	1510	1660	1780	1690	1600	1280	1920	2890	890	1440	2340
3	1430	1720	1650	1720	1610	1200	1320	1820	2520	1060	1520	2490
4	1550	1300	1720	1530	1620	1170	1240	1570	1640	701	1440	1490
5	1510	1340	1730	1860	1470	1200	1270	1440	1540	1170	750	2090
6	1430	1400	1550	1880	1820	1240	1730	1210	1500	1110	823	1890
7	1510	1600	1910	1530	1580	1530	1990	1210	1470	1040	1180	1770
8	1690	1620	1820	1630	1530	1580	1520	1310	1360	1030	1360	1600
9	1840	1650	1770	1580	1590	1600	1660	1830	1330	962	1350	1460
10	2060	1720	1710	1710	1590	1450	1780	1770	896	1190	1250	1490
11	2030	1690	1650	1620	1240	1050	1610	2010	1070	1260	1180	1630
12	2640	1380	1800	1910	1220	1110	1460	2020	2640	1300	817	2310
13	2730	1170	1770	1690	1560	1270	1560	2010	2780	1200	895	2540
14	2490	1820	1690	1790	1500	1390	1560	2680	2270	1300	1500	3270
15	2290	1830	1840	1690	1350	1290	1230	2920	1570	933	1240	3500
16	2210	1320	1890	1770	1390	1340	1280	2760	1270	766	1220	3430
17	2080	1490	1920	1700	1000	1160	1400	2630	1220	1300	1120	3440
18	2010	1390	1780	1730	1300	960	1370	2910	1220	1130	1190	3610
19	2250	1280	1770	1680	1290	987	1370	2700	1340	1400	799	3940
20	2000	1170	2100	1640	1330	987	1460	2540	1430	1560	630	3330
21	1950	1460	1900	1190	1720	1110	1090	2420	1420	1710	1390	2720
22	1700	1350	1950	1540	1540	1120	1710	2220	1310	1400	1450	2380
23	1450	1450	1930	1570	1420	1430	1490	1970	1240	1310	2600	1570
24	1640	1070	1940	1540	1750	1410	1490	1430	760	1620	3670	1800
25	1920	1290	1880	1480	1680	758	1030	1380	804	1630	3430	1200
26	1590	1450	2030	1580	1440	1040	1700	1460	1440	1880	3240	1170
27	1630	1480	2080	1570	1450	1290	1660	1360	1200	2010	3410	1390
28	1620	1490	2020	1370	1420	1570	1710	2200	1280	1830	4110	1220
29	1640	1580	1960	1240	---	1580	1580	1920	1280	1280	4100	1360
30	1160	1470	1990	1600	---	1440	1310	2370	1280	1370	3230	1680
31	1590	---	1760	1500	---	1530	---	2400	---	1400	2590	---
TOTAL	57340	44040	56650	50120	41630	39912	44170	61950	46710	39586	56134	66440
MEAN	1850	1468	1827	1617	1487	1287	1472	1998	1557	1277	1811	2215
MAX	2730	1830	2100	1910	1820	1600	1990	2920	2890	2010	4110	3940
MIN	1160	1070	1480	1190	1000	758	1030	1210	760	701	630	1170
CAL YR 1977 TOTAL	516554			1415		4190		537				
WTR YR 1978 TOTAL	604682			1657		4110		630				

## 04065300 WEST BRANCH STURGEON RIVER NEAR RANDVILLE, MI

LOCATION.--Lat 46°00'45", long 87°58'41", in NE¼ sec.30, T.42 N., R.29 W., Dickinson County, Hydrologic Unit 04030108, on right bank 500 ft (152 m) downstream from county highway bridge, 3.0 mi (4.8 km) downstream from Tom Kings Creek, and 4.0 mi (6.4 km) north-east of Randville.

DRAINAGE AREA.--56.1 mi<sup>2</sup> (145.3 km<sup>2</sup>).

PERIOD OF RECORD.--August 1958 to current year.

REVISED RECORDS.--WSP 1911: Drainage area.

GAGE.--Water-stage recorder. Sharp-crested weir since Aug. 6, 1976. Altitude of gage is 1,170 ft (357 m) from topographic map (nearest 10 ft).

REMARKS.--Records fair. Since December 1958, diversion above station for industrial use; figures of runoff adjusted thereafter. Small diversions for sprinkler irrigation. Several observations of water temperature were made during the year.

AVERAGE DISCHARGE.--20 years, 42.9 ft<sup>3</sup>/s (1.215 m<sup>3</sup>/s), 10.38 in/yr (264 mm/yr), adjusted for industrial diversion.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 570 ft<sup>3</sup>/s (16.1 m<sup>3</sup>/s) May 7, 1960, gage height, 6.40 ft (1.951 m); minimum, 1.5 ft<sup>3</sup>/s (0.042 m<sup>3</sup>/s) July 22, 1964, gage height, 1.35 ft (0.411 m); minimum daily, 3.4 ft<sup>3</sup>/s (0.096 m<sup>3</sup>/s) July 22, 1964.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 299 ft<sup>3</sup>/s (8.47 m<sup>3</sup>/s) Aug. 24, gage height, 5.48 ft (1.670 m); minimum, 7.0 ft<sup>3</sup>/s (0.198 m<sup>3</sup>/s) Aug. 15, gage height, 3.45 ft (1.052 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	41	20	18	19	14	11	38	60	58	11	14	38
2	34	23	19	19	14	11	34	54	45	14	18	29
3	28	38	19	17	14	12	33	46	33	13	16	25
4	27	65	19	16	14	12	39	42	25	11	13	23
5	23	60	18	17	14	12	58	40	20	9.8	11	23
6	21	47	18	18	14	12	88	36	18	9.7	9.8	20
7	19	44	17	18	13	12	104	32	15	18	9.0	19
8	43	42	17	18	13	12	118	38	19	36	8.7	18
9	94	41	17	17	13	12	114	62	19	22	9.0	19
10	106	49	17	17	13	12	114	65	15	15	8.3	20
11	89	47	17	16	13	12	128	59	19	14	8.1	39
12	83	38	16	16	13	13	130	57	104	14	8.2	41
13	70	32	17	15	13	13	128	59	142	14	8.7	49
14	56	32	17	15	13	13	116	99	132	14	8.2	66
15	46	30	17	15	13	13	100	131	84	14	19	94
16	38	30	17	15	13	13	96	109	57	11	96	74
17	34	29	20	15	12	12	100	82	46	14	82	47
18	31	28	30	14	12	12	106	67	45	38	51	40
19	30	26	31	14	12	13	106	59	33	40	40	44
20	28	33	31	14	12	13	118	53	28	40	29	42
21	26	64	31	14	11	14	110	42	20	26	20	37
22	24	51	29	14	11	14	98	32	16	60	23	31
23	22	41	27	14	11	15	94	26	14	80	132	26
24	21	31	25	14	11	14	94	23	13	54	272	23
25	21	25	24	14	12	14	94	20	12	38	248	20
26	21	23	23	14	12	15	90	19	13	42	114	20
27	20	22	22	14	12	18	86	22	13	26	74	44
28	19	20	21	14	12	22	80	53	12	18	142	49
29	19	19	20	14	---	26	78	67	10	16	173	56
30	19	18	19	14	---	29	72	74	9.2	14	98	86
31	19	---	19	14	---	32	---	70	---	14	54	---
TOTAL	1172	1068	652	479	354	458	2764	1698	1089.2	760.5	1817.0	1162
MEAN	37.8	35.6	21.0	15.5	12.6	14.8	92.1	54.8	36.3	24.5	58.6	38.7
MAX	106	65	31	19	14	32	130	131	142	80	272	94
MIN	19	18	16	14	11	11	33	19	9.2	9.7	8.1	18
+	5.0	4.6	5.8	5.8	5.9	5.6	5.7	5.6	5.4	5.3	4.7	5.7
MEAN‡	42.8	40.2	26.8	21.3	18.5	20.4	97.8	60.4	41.7	29.8	63.3	44.4
CFSM‡	.76	.72	.48	.38	.33	.36	1.74	1.08	.74	.53	1.13	.79
IN‡	.88	.80	.55	.44	.34	.42	1.95	1.24	.83	.61	1.30	.88

CAL YR 1977 TOTAL 10958.2 MEAN 30.0 MAX 195 MIN 4.0 MEAN‡ 34.9 CFSM‡ .62 IN‡ 8.45  
WTR YR 1978 TOTAL 13473.7 MEAN 36.9 MAX 272 MIN 8.1 MEAN‡ 42.3 CFSM‡ .75 IN‡ 10.25

\*Average monthly diversion, equivalent in cubic feet per second, for industrial use; furnished by Hanna Mining Co.  
‡Adjusted for diversion.

LOCATION.--Lat 46°01'34", long 87°49'56", in NW¼ NE¼ sec.20, T.42 N., R.28 W., Dickinson County, Hydrologic Unit 04030108, on right bank 50 ft (15 m) downstream from Skunk Creek, and 2.2 mi (3.5 km) north of Felch.

PERIOD OF RECORD.--Occasional low-flow measurements, water years 1972, 1973. October 1973 to current year.

REMARKS.--Records fair. Since June 1975, occasional regulation during low flows by Gene Lake Reservoir (usable capacity, 3,990 acre-ft or 4.92 hm<sup>3</sup>) 3 mi (5 km) above station. Several observations of water temperature were made during the year.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 612 ft<sup>3</sup>/s (17.3 m<sup>3</sup>/s) Apr. 24, 1975, gage height, 4.26 ft (1.298 m); minimum, 3.4 ft<sup>3</sup>/s (0.096 m<sup>3</sup>/s) Sept. 7, 8, 9, 13, 1976.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 308 ft<sup>3</sup>/s (8.72 m<sup>3</sup>/s) Aug. 24, 25, gage height, 3.63 ft (1.106 m); minimum, 12 ft<sup>3</sup>/s (0.340 m<sup>3</sup>/s) Aug. 13-15; minimum gage height, 0.06 ft (0.018 m) Aug. 15.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	75	29	29	26	20	17	41	102	67	17	28	150
2	64	33	28	26	20	17	44	90	59	17	28	120
3	54	50	28	25	20	17	45	82	50	16	28	110
4	47	85	28	25	20	17	49	76	44	15	24	90
5	44	88	28	26	20	17	60	67	40	15	21	75
6	40	80	28	26	20	17	80	61	36	16	19	60
7	37	77	28	26	19	17	106	56	33	20	17	50
8	57	74	28	26	19	17	132	56	34	24	16	47
9	96	71	28	26	19	16	148	71	34	21	15	45
10	106	73	28	25	19	16	163	74	30	20	14	45
11	109	69	28	24	18	16	173	72	34	17	14	70
12	109	59	29	24	18	17	176	72	98	16	13	100
13	96	50	29	23	18	17	181	73	117	16	13	120
14	84	46	30	23	18	17	172	134	105	16	12	160
15	73	44	31	23	18	17	155	180	90	20	13	190
16	64	43	32	22	18	18	142	188	78	17	34	193
17	55	42	35	22	18	18	144	170	67	16	34	166
18	51	40	37	21	18	19	150	136	59	21	33	123
19	48	37	40	21	18	19	163	106	49	30	37	105
20	44	41	43	21	18	20	179	94	42	33	34	94
21	41	60	44	21	18	20	178	83	39	32	29	82
22	38	82	43	21	17	20	164	70	34	34	26	70
23	36	66	40	21	17	21	155	59	30	82	119	59
24	34	54	37	20	17	22	149	52	27	80	275	53
25	32	50	34	20	17	23	146	46	26	63	305	47
26	31	40	30	20	17	25	146	43	25	58	265	46
27	30	36	28	20	17	27	142	42	23	52	214	78
28	30	33	27	20	17	29	132	71	21	42	216	78
29	29	31	27	20	---	31	126	78	19	37	229	95
30	28	30	26	20	---	33	116	83	19	32	213	132
31	28	---	26	20	---	36	---	77	---	29	188	---
TOTAL	1710	1613	977	704	513	633	3957	2664	1428	924	2526	2853
MEAN	55.2	53.8	31.5	22.7	18.3	20.4	132	85.9	47.6	29.8	81.5	95.1
MAX	109	88	44	26	20	36	181	188	117	82	305	193
MIN	28	29	26	20	17	16	41	42	18	15	12	45
CFSM	.89	.87	.51	.37	.30	.33	2.14	1.39	.77	.48	1.32	1.54
IN.	1.03	.97	.59	.42	.31	.38	2.38	1.60	.86	.56	1.52	1.72
CAL YR 1977	TOTAL	15106.8	MEAN	41.4	MAX	226	MIN	5.8	CFSM	.67	IN	9.09
WTR YR 1978	TOTAL	20502.0	MEAN	56.2	MAX	305	MIN	12	CFSM	.91	IN	12.34

## STREAMS TRIBUTARY TO LAKE MICHIGAN

135

## 04065397 EAST BRANCH STURGEON RIVER AT HARDWOOD, MI

LOCATION.--Lat 45°57'55", long 87°41'53", in SW¼ NW¼ sec.9, T.41 N., R.27 W., Dickinson County, Hydrologic Unit 04030108, on right bank 10 ft (3 m) downstream from bridge on county highway, at Hardwood, 350 ft (107 m) upstream from Schultz Creek, and 9 mi (14 km) upstream from confluence with West Branch.

DRAINAGE AREA.--90.8 mi<sup>2</sup> (235.2 km<sup>2</sup>). Area of site used prior to October 1, 1977, 89.8 mi<sup>2</sup> (232.6 km<sup>2</sup>).

## WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--Occasional low-flow measurements, water years 1972-77. October 1977 to September 1978.

GAGE.--Water-stage recorder. Altitude of gage is 1,030 ft (314 m) from topographic map (nearest 10 ft).

REMARKS.--Water-discharge records good. Occasional regulation during low flows by Gene Lake Reservoir in headwaters (see station 04065393) and Hardwood Reservoir 1.2 mi (1.9 km) upstream, combined usable capacity, 11,180 acre-ft (13.8 hm<sup>3</sup>). Prior to Jan. 1, 1978, 6,000 acre-ft (7.40 hm<sup>3</sup>) stored during the completed refilling of Hardwood Reservoir.

EXTREMES FOR CURRENT YEAR.--Maximum daily discharge, 350 ft<sup>3</sup>/s (9.91 m<sup>3</sup>/s) Aug. 28; minimum discharge, 3.6 ft<sup>3</sup>/s (0.102 m<sup>3</sup>/s) Oct. 29, 31, occurred during the refilling of Hardwood Reservoir.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	134	4.1	5.3	38	32	25	61	167	88	32	44	225
2	134	4.5	5.4	38	30	25	62	156	50	33	38	205
3	130	9.7	5.6	38	32	25	65	143	49	32	40	180
4	127	11	5.5	38	30	25	75	131	49	32	35	160
5	124	8.6	5.6	38	30	25	82	147	48	31	34	140
6	119	7.5	5.6	39	29	25	99	160	48	31	32	72
7	115	7.8	5.6	41	29	24	117	139	42	33	28	66
8	117	7.7	5.6	41	28	24	131	122	32	33	26	64
9	115	6.7	5.6	43	28	24	147	121	32	32	24	70
10	113	7.3	5.6	40	28	24	182	119	32	32	27	90
11	115	7.1	5.6	39	28	24	198	121	36	29	25	120
12	117	11	5.6	38	27	25	213	117	41	27	24	150
13	117	11	5.6	37	27	25	229	118	52	28	23	180
14	119	11	5.6	36	27	26	226	164	95	27	23	260
15	119	11	5.6	35	27	26	222	194	108	27	24	250
16	114	11	8.1	34	27	28	197	210	128	26	25	240
17	110	11	21	35	27	28	195	225	136	28	26	220
18	110	12	35	34	27	28	204	224	129	29	45	220
19	106	12	47	31	26	28	216	225	115	29	62	210
20	102	13	55	31	26	28	234	199	74	30	80	205
21	96	15	63	30	26	30	207	166	68	28	100	180
22	86	13	67	30	28	30	224	146	59	33	125	160
23	64	14	62	30	25	30	224	133	59	49	170	106
24	47	14	59	30	25	30	217	128	51	75	240	47
25	42	14	49	29	26	31	213	121	29	117	270	72
26	40	13	44	30	25	32	213	125	28	147	299	83
27	37	14	41	30	25	35	207	114	28	148	282	89
28	26	11	40	31	25	40	202	114	25	136	350	97
29	4.2	5.0	39	31	---	45	190	116	31	115	320	120
30	4.1	4.9	39	31	---	49	177	112	32	55	280	144
31	4.0	---	38	31	---	55	---	104	---	54	250	---
TOTAL	2807.3	302.9	790.5	1077	770	919	5229	4581	1794	1558	3371	4425
MEAN	90.6	10.1	25.5	34.7	27.5	29.6	174	148	59.8	50.3	109	148
MAX	134	15	67	43	32	55	234	225	136	148	350	260
MIN	4.0	4.1	5.3	29	25	24	61	104	25	26	23	47
CFSM	1.00	.11	.28	.38	.30	.33	1.92	1.63	.66	.55	1.20	1.63
IN	1.15	.12	.32	.44	.32	.38	2.14	1.88	.73	.64	1.38	1.81

WTR YR 1978 TOTAL 27624.7 MEAN 75.7 MAX 350 MIN 4.0 IN 11.32 MEAN+ 84.0 CFSM+ 0.92 IN+ 12.56

\*Adjusted for completed refilling of Hardwood Reservoir.



STREAMS TRIBUTARY TO LAKE MICHIGAN  
04065397 EAST BRANCH STURGEON RIVER AT HARDWOOD, MI--CONTINUED

WATER-QUALITY RECORDS

PERIOD OF DAILY RECORD.--

WATER TEMPERATURES: December 1977 to September 1978.

INSTRUMENTATION.--Water-quality monitor since December 1977.

REMARKS.--Intermittent ice cover during winter period.

EXTREMES FOR PERIOD OF DAILY RECORD.--

WATER TEMPERATURES: Maximum, 21.5°C Aug. 14; minimum, 0.0°C on many days during winter period.

TEMPERATURE (DEG. C) OF WATER, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
	OCTOBER			NOVEMBER			DECEMBER			JANUARY		
1							---	---	---	.5	.0	.0
2							---	---	---	.0	.0	.0
3							---	---	---	.0	.0	.0
4							---	---	---	.5	.0	.0
5							---	---	---	.5	.0	.0
6							.0	.0	.0	.5	.0	.0
7							.0	.0	.0	1.0	.0	.5
8							.0	.0	.0	.5	.0	.0
9							.0	.0	.0	.0	.0	.0
10							.0	.0	.0	.0	.0	.0
11							.0	.0	.0	.0	.0	.0
12							.0	.0	.0	.0	.0	.0
13							.0	.0	.0	.0	.0	.0
14							1.5	.0	1.0	.0	.0	.0
15							2.0	1.0	1.5	.5	.0	.0
16							2.0	1.5	2.0	.5	.0	.0
17							1.5	1.0	1.5	.0	.0	.0
18							1.0	.0	1.0	.0	.0	.0
19							1.5	.5	1.0	.0	.0	.0
20							1.5	1.0	1.5	.5	.0	.0
21							1.5	1.0	1.5	.5	.0	.0
22							1.5	1.0	1.5	.0	.0	.0
23							1.5	1.0	1.5	.5	.0	.5
24							1.0	.5	1.0	1.0	.5	.5
25							1.0	.0	.5	1.5	.0	.5
26							.5	.0	.0	.5	.0	.0
27							.0	.0	.0	.5	.0	.0
28							.5	.0	.0	.5	.0	.0
29							.5	.0	.0	.5	.0	.0
30							.5	.0	.0	.5	.0	.0
31							.5	.0	.0	.5	.0	.0
MONTH										1.5	.0	.0

04065397 EAST BRANCH STURGEON RIVER AT HARDWOOD, MI--CONTINUED

TEMPERATURE (DEG. C) OF WATER, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
FEBRUARY			MARCH			APRIL			MAY			
1	.0	.0	.0	1.0	.0	.5	2.0	1.0	1.5	5.5	4.0	4.5
2	.0	.0	.0	1.0	.0	.5	2.5	.5	1.0	6.5	4.5	5.5
3	.0	.0	.0	1.5	.0	.5	1.5	1.0	1.5	7.0	5.0	6.0
4	.0	.0	.0	1.0	.0	.0	2.0	1.0	1.5	8.5	6.5	7.5
5	.0	.0	.0	1.0	.0	.0	3.5	.5	1.5	8.5	7.0	8.0
6	.0	.0	.0	1.5	.0	.5	1.5	1.0	1.5	8.5	7.0	7.5
7	.5	.0	.5	2.0	.0	.5	2.5	1.0	1.5	9.0	7.0	7.5
8	1.0	.0	.5	2.5	.0	1.0	2.5	1.0	1.5	7.5	7.0	7.0
9	1.5	.0	.5	2.5	.0	1.0	1.5	1.0	1.5	7.0	6.5	7.0
10	1.0	.0	.5	3.0	1.0	1.5	1.0	1.0	1.0	8.5	6.5	7.5
11	1.5	.0	.5	4.5	.0	1.5	1.5	.5	1.0	9.0	7.0	7.5
12	2.0	.0	.5	3.5	.0	1.5	1.5	.5	1.0	8.5	7.5	8.0
13	2.0	.0	1.0	2.0	1.0	1.5	1.0	.5	.5	9.0	8.0	8.5
14	2.0	.0	.5	2.5	.5	1.5	1.0	.5	.5	8.5	8.0	8.0
15	2.0	.0	.5	4.0	.5	1.5	1.5	.0	.5	10.0	7.5	8.5
16	1.5	.0	.5	2.0	.0	1.0	2.0	.0	1.0	11.5	9.0	10.0
17	1.0	.0	.5	3.0	.0	1.0	2.0	.5	1.0	13.0	9.5	11.0
18	1.0	.0	.0	1.5	.0	.5	1.5	.5	1.0	12.5	10.5	11.5
19	.5	.0	.0	4.0	.0	1.5	.5	.5	.5	12.5	9.5	11.0
20	.5	.0	.0	2.0	.0	.5	1.0	.5	.5	11.5	11.0	11.0
21	.5	.0	.0	2.0	.5	1.5	2.0	.5	1.0	11.5	10.5	11.0
22	.5	.0	.0	5.0	.5	2.0	2.0	.5	1.0	11.5	10.0	10.5
23	1.5	.0	.5	4.5	.0	1.5	1.5	1.0	1.5	11.5	10.0	10.5
24	1.5	.0	1.0	4.0	.0	1.0	2.0	1.0	1.5	12.0	10.5	11.0
25	2.0	.0	1.0	4.0	.0	1.0	2.5	1.5	2.0	12.0	11.0	11.5
26	2.0	.0	.5	5.0	.0	1.5	3.0	2.0	2.0	13.0	11.5	12.0
27	2.0	.0	1.0	4.0	.0	1.5	3.5	2.0	2.5	13.5	12.0	12.5
28	1.5	.0	.5	4.0	.5	1.5	4.0	2.5	3.0	13.0	12.5	13.0
29	---	---	---	4.0	.5	1.5	4.0	3.0	3.5	14.0	13.0	13.5
30	---	---	---	2.0	1.0	1.5	5.0	3.5	4.0	14.5	13.0	13.5
31	---	---	---	2.0	1.0	1.5	---	---	---	14.5	13.5	14.0
MONTH	2.0	.0	.5	5.0	.0	1.0	5.0	.0	1.5	14.5	4.0	9.5

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
JUNE			JULY			AUGUST			SEPTEMBER			
1	14.5	13.0	14.0	15.5	14.5	15.0	19.5	17.5	18.5	19.0	18.5	19.0
2	14.0	12.0	13.0	17.0	14.5	15.5	20.5	17.0	18.5	19.0	18.5	18.5
3	14.5	12.0	13.0	19.0	14.5	16.5	19.5	16.5	18.0	20.5	18.5	19.5
4	13.5	13.0	13.0	19.5	14.5	16.5	20.5	16.5	18.0	19.5	16.5	18.0
5	15.5	13.0	14.0	19.0	15.0	16.5	21.0	17.0	18.5	17.5	16.5	17.0
6	16.0	13.5	14.5	18.0	15.5	16.5	21.0	17.0	18.5	18.0	17.0	17.5
7	15.0	13.5	14.0	18.0	15.5	16.0	21.0	17.0	18.5	18.0	17.5	18.0
8	16.5	12.5	14.5	20.0	15.5	17.0	21.0	17.0	18.5	17.5	17.0	17.5
9	16.5	13.5	14.5	17.0	15.5	16.0	19.5	17.0	18.0	17.5	16.5	17.0
10	16.5	13.5	14.5	18.5	14.5	16.0	21.0	16.5	18.0	18.0	16.5	17.0
11	15.0	14.0	14.5	20.5	14.5	16.5	20.5	16.5	18.0	18.5	17.0	17.5
12	15.0	13.5	14.0	19.0	15.0	16.5	21.0	16.5	18.0	19.0	18.5	18.5
13	15.5	13.0	14.0	20.0	15.5	17.0	21.0	17.0	18.5	18.5	17.0	17.5
14	15.0	14.5	15.0	20.5	15.0	17.0	21.5	17.0	19.0	17.0	14.5	15.5
15	15.5	15.0	15.0	20.0	15.5	17.0	21.0	17.5	18.5	17.5	15.5	16.5
16	15.5	15.0	15.0	21.0	15.0	17.5	18.0	17.5	17.5	18.0	17.0	17.0
17	15.0	15.0	15.0	20.0	16.0	17.5	20.5	16.5	18.0	17.0	16.5	17.0
18	15.5	15.0	15.0	17.5	16.5	17.0	18.5	17.0	17.5	17.0	15.0	16.0
19	16.0	15.0	15.5	20.5	16.0	17.5	19.5	18.0	18.5	15.0	12.5	14.0
20	15.5	14.5	15.0	19.0	16.5	17.0	20.0	18.0	18.5	15.0	12.5	14.0
21	16.0	14.0	15.0	19.0	15.5	17.0	20.5	18.5	19.0	15.5	15.0	15.5
22	17.0	13.5	15.0	17.0	15.5	16.0	21.0	17.5	19.0	15.5	15.0	15.5
23	16.5	14.0	15.0	19.5	15.5	17.0	19.0	17.5	18.5	15.5	14.5	15.0
24	17.0	14.0	15.0	21.0	17.5	19.0	21.0	19.0	20.0	16.5	14.0	15.0
25	16.5	14.0	15.0	19.5	18.5	19.0	21.0	20.0	20.5	16.0	14.5	15.0
26	18.0	14.0	15.5	20.0	19.0	19.5	20.0	19.5	20.0	15.0	14.5	15.0
27	19.0	14.0	16.0	20.5	19.5	20.0	20.0	18.5	19.5	16.0	14.5	15.0
28	17.5	14.0	15.5	20.0	19.0	19.5	19.5	18.0	18.5	15.5	14.5	15.0
29	18.5	14.5	16.0	20.0	18.5	19.5	20.0	19.0	19.5	15.0	14.5	14.5
30	17.5	14.0	15.5	20.0	17.5	18.5	21.0	19.0	20.0	14.5	14.0	14.0
31	---	---	---	19.0	17.5	18.0	20.0	19.0	19.5	---	---	---
MONTH	19.0	12.0	14.5	21.0	14.5	17.5	21.5	16.5	18.5	20.5	12.5	16.5

## STREAMS TRIBUTARY TO LAKE MICHIGAN

04065500 STURGEON RIVER NEAR FOSTER CITY, MI

LOCATION.--Lat 45°54'30", long 87°45'15", in NW¼ sec.36, T.41 N., R.28 W., Dickinson County, Hydrologic Unit 04030108, on left bank 30 ft (9 m) downstream from bridge on County Highway 569, 1.8 mi (2.9 km) downstream from confluence of East and West Branches, and 4.0 mi (6.4 km) south of Foster City.

DRAINAGE AREA.--237 mi<sup>2</sup> (614 km<sup>2</sup>).

## WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--October 1954 to current year.

REVISED RECORDS.--WSP 1911: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 966.6 ft (294.620 m) National Geodetic Vertical Datum of 1929.

REMARKS.--Water-discharge records good except those for the winter period, which are fair. Since December 1958, diversion above station for industrial use; figures of runoff adjusted thereafter. Since June 1975, occasional regulation during low flows by reservoirs in headwaters of East Branch (see stations 04065393 and 04065397). The completed refilling of Hardwood Reservoir on East Branch Sturgeon River, 9 mi (14 km) above station, stored 6,000 acre-ft (7.40 km<sup>3</sup>) during the year. Small diversions for sprinkler irrigation.

AVERAGE DISCHARGE.--24 years, 185 ft<sup>3</sup>/s (5.239 m<sup>3</sup>/s), 10.60 in/yr (269 mm/yr), adjusted for industrial diversion.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 2,570 ft<sup>3</sup>/s (72.8 m<sup>3</sup>/s) May 8, 1960, gage height, 10.35 ft (3.155 m); minimum, 15 ft<sup>3</sup>/s (0.42 m<sup>3</sup>/s) July 24, 1964; minimum gage height, 1.96 ft (0.597 m) Aug. 21, 1970.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 832 ft<sup>3</sup>/s (23.6 m<sup>3</sup>/s) Aug. 28, gage height, 6.61 ft (2.015 m); minimum, 54 ft<sup>3</sup>/s (1.53 m<sup>3</sup>/s) Aug. 14, 15; minimum gage height, 2.55 ft (0.777 m) Oct. 31.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	268	72	90	105	80	62	160	366	244	65	131	539
2	246	80	84	100	80	62	170	330	192	68	122	413
3	227	121	78	100	78	62	200	302	154	69	125	348
4	214	227	75	96	78	62	230	274	139	68	113	300
5	207	233	75	95	76	62	256	253	130	65	99	258
6	198	213	73	94	74	62	294	274	122	63	89	197
7	188	199	72	92	74	62	362	260	115	74	81	150
8	219	185	70	90	72	62	410	239	107	104	76	142
9	296	173	70	88	70	62	438	255	99	98	71	136
10	330	175	72	88	70	62	482	272	95	93	68	135
11	355	168	72	86	70	62	542	270	95	80	62	172
12	361	156	76	84	70	62	578	259	170	68	58	302
13	336	138	78	84	70	62	595	254	227	62	57	358
14	309	123	82	82	70	62	580	378	268	60	57	424
15	281	116	88	82	70	64	540	528	301	64	59	622
16	257	113	98	80	68	66	508	545	290	61	151	631
17	239	110	110	80	68	66	486	530	261	94	181	556
18	232	105	120	80	66	66	480	470	245	126	196	482
19	224	100	135	80	64	66	500	426	227	148	207	482
20	212	106	145	78	64	68	578	381	182	186	218	450
21	202	159	150	78	64	70	602	333	148	183	202	405
22	190	166	150	78	64	70	570	288	121	166	141	351
23	171	163	145	78	64	72	530	252	111	337	233	304
24	144	154	140	78	64	74	508	225	105	381	582	200
25	130	151	135	78	64	78	488	208	94	353	734	151
26	123	135	130	78	64	86	474	200	81	334	764	169
27	118	125	125	78	64	100	462	192	77	345	770	214
28	113	115	120	78	64	110	442	213	73	314	814	250
29	89	105	115	78	---	120	420	250	69	263	803	279
30	71	96	115	78	---	135	395	270	67	200	729	365
31	68	---	110	78	---	150	---	262	---	145	657	---
TOTAL	6618	4282	3198	2622	1944	2329	13280	9559	4609	4737	8650	9785
MEAN	213	143	103	84.6	69.4	75.1	443	308	154	153	279	326
MAX	361	233	150	105	80	150	602	545	301	381	814	631
MIN	68	72	70	78	64	62	160	192	67	60	57	135
+	5.0	4.6	5.8	5.8	5.9	5.6	5.7	5.6	5.4	5.3	4.7	5.7
MEAN‡	218	148	109	90.4	75.3	80.7	449	314	159	158	284	332
CFSM‡	.92	.62	.46	.38	.32	.34	1.89	1.32	.67	.67	1.20	1.40
IN‡	1.06	.69	.53	.44	.33	.39	2.11	1.53	.75	.77	1.38	1.56

CAL YR 1977 TOTAL 52357 MEAN 143 MAX 724 MIN 25 MEAN‡ 148 CFSM‡ .62 IN‡ 8.50

WTR YR 1978 TOTAL 71613 MEAN 196 MAX 814 MIN 57 MEAN‡ 202 CFSM‡ .85 IN‡ 11.55

+Average monthly diversion, equivalent in cubic feet per second, for industrial use; furnished by Hanna Mining Co.

‡Adjusted for diversion.

## STREAMS TRIBUTARY TO LAKE MICHIGAN

139

04065500 STURGEON RIVER-NEAR FOSTER CITY, MI--CONTINUED

## WATER-QUALITY RECORDS

## PERIOD OF DAILY RECORD.--

WATER TEMPERATURES: July 1956 to current year.

INSTRUMENTATION.--Temperature recorder since July 26, 1956.

REMARKS.--Temperature recorder malfunctioned Oct. 1-26, Oct. 30 to Nov. 4; clock stopped Nov. 12 to Dec. 6 (range in temperature 0.0 to 5.0°C). Complete ice cover during winter period.

## EXTREMES FOR PERIOD OF DAILY RECORD.--

WATER TEMPERATURES: Maximum, 30.0°C July 1, 1963, July 19, 1977; minimum, 0.0°C on many days during winter periods.

## EXTREMES FOR CURRENT YEAR.--

WATER TEMPERATURES: Maximum, 24.5°C Aug. 14, 15; minimum, 0.0°C on many days during winter period.

## TEMPERATURE (DEG. C) OF WATER, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DAY	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN
	OCTOBER		NOVEMBER		DECEMBER		JANUARY		FEBRUARY		MARCH	
1	---	---	---	---	---	---	.0	.0	.0	.0	.0	.0
2	---	---	---	---	---	---	.0	.0	.0	.0	.0	.0
3	---	---	---	---	---	---	.0	.0	.0	.0	.0	.0
4	---	---	---	---	---	---	.0	.0	.0	.0	.0	.0
5	---	---	7.5	6.5	---	---	.0	.0	.0	.0	.0	.0
6	---	---	6.5	6.0	---	---	.0	.0	.0	.0	.0	.0
7	---	---	7.0	6.5	.0	.0	.0	.0	.0	.0	.0	.0
8	---	---	8.0	7.0	.0	.0	.0	.0	.0	.0	.0	.0
9	---	---	9.0	8.0	.0	.0	.0	.0	.0	.0	.0	.0
10	---	---	9.0	7.5	.0	.0	.0	.0	.0	.0	.0	.0
11	---	---	7.5	---	.0	.0	.0	.0	.0	.0	.0	.0
12	---	---	---	---	.0	.0	.0	.0	.0	.0	.0	.0
13	---	---	---	---	.0	.0	.0	.0	.0	.0	.0	.0
14	---	---	---	---	.0	.0	.0	.0	.0	.0	.0	.0
15	---	---	---	---	.0	.0	.0	.0	.0	.0	.0	.0
16	---	---	---	---	.0	.0	.0	.0	.0	.0	.0	.0
17	---	---	---	---	.0	.0	.0	.0	.0	.0	.0	.0
18	---	---	---	---	.0	.0	.0	.0	.0	.0	.0	.0
19	---	---	---	---	.0	.0	.0	.0	.0	.0	.0	.0
20	---	---	---	---	.0	.0	.0	.0	.0	.0	.0	.0
21	---	---	---	---	.0	.0	.0	.0	.0	.0	.0	.0
22	---	---	---	---	.0	.0	.0	.0	.0	.0	.0	.0
23	---	---	---	---	.0	.0	.0	.0	.0	.0	.0	.0
24	---	---	---	---	.0	.0	.0	.0	.0	.0	.0	.0
25	---	---	---	---	.0	.0	.0	.0	.0	.0	.0	.0
26	---	---	---	---	.0	.0	.0	.0	.0	.0	.0	.0
27	9.5	8.0	---	---	.0	.0	.0	.0	.0	.0	.0	.0
28	8.5	6.5	---	---	.0	.0	.0	.0	.0	.0	.0	.0
29	8.0	6.0	---	---	.0	.0	.0	.0	---	---	.0	.0
30	---	---	---	---	.0	.0	.0	.0	---	---	.0	.0
31	---	---	---	---	.0	.0	.0	.0	---	---	.0	.0
MONTH							.0	.0	.0	.0	.0	.0

STREAMS TRIBUTARY TO LAKE MICHIGAN  
04065500 STURGEON RIVER NEAR FOSTER CITY, MI--CONTINUED

TEMPERATURE (DEG. C) OF WATER, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DAY	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN
	APRIL		MAY		JUNE		JULY		AUGUST		SEPTEMBER	
1	.0	.0	8.5	6.0	18.5	15.5	22.0	18.5	19.0	16.0	17.5	16.0
2	.0	.0	9.0	6.5	17.0	15.0	18.5	17.5	20.0	17.5	18.0	17.5
3	.0	.0	10.0	7.5	16.5	14.5	22.0	17.5	19.5	17.0	18.0	17.0
4	.5	.0	11.0	9.0	16.0	14.5	22.5	18.5	19.0	15.5	17.5	16.5
5	2.0	.5	12.0	9.5	16.5	13.0	23.5	19.5	20.0	16.5	18.0	17.5
6	.5	.5	12.5	10.0	18.5	14.5	24.0	21.5	21.5	18.0	19.5	17.0
7	1.5	.5	12.0	10.0	17.5	14.5	24.0	22.0	22.0	19.0	19.0	17.5
8	2.5	1.0	12.0	10.5	17.0	12.5	23.5	20.0	22.5	20.0	17.5	17.0
9	2.5	1.5	10.5	9.5	18.0	14.5	23.0	20.5	22.0	19.5	17.0	16.5
10	1.5	1.0	12.0	8.5	18.0	14.5	20.5	17.5	21.0	17.5	19.0	16.5
11	1.5	1.0	13.5	11.5	18.0	17.0	20.5	16.5	21.0	18.0	18.0	17.5
12	2.0	1.0	13.5	12.0	17.5	15.5	20.5	17.5	22.0	18.5	17.0	15.0
13	2.5	2.0	11.5	9.0	15.5	13.0	21.5	18.5	24.0	19.5	15.0	14.0
14	2.5	1.5	8.5	8.0	15.0	12.5	22.5	18.5	24.5	21.0	14.5	14.0
15	3.5	2.0	12.5	8.0	15.0	12.0	22.5	19.5	24.5	22.0	14.5	14.0
16	4.5	2.5	15.0	12.0	17.0	15.0	22.5	19.0	23.0	20.0	14.5	13.5
17	5.0	3.0	17.0	13.5	17.5	17.0	22.0	19.5	20.5	18.5	14.5	14.0
18	5.0	3.5	17.0	14.5	19.0	16.5	21.5	20.5	20.5	19.0	14.5	14.0
19	3.5	3.0	17.0	14.5	19.0	16.5	23.0	20.0	19.5	18.5	14.5	14.0
20	3.0	2.0	17.0	14.5	18.5	17.5	22.5	21.0	19.0	16.5	14.5	14.0
21	5.0	2.0	14.5	12.5	18.0	16.0	21.0	19.0	19.5	17.5	14.5	14.0
22	6.0	3.5	15.0	13.0	19.5	15.0	20.0	16.5	21.5	18.5	14.0	13.0
23	5.5	4.5	15.5	13.5	18.5	16.0	17.5	15.5	21.0	17.0	13.5	13.0
24	6.0	4.0	17.0	14.0	19.5	16.0	19.5	16.5	16.5	16.0	14.5	13.0
25	7.5	4.5	17.0	15.5	19.5	18.0	19.5	18.0	16.5	16.0	14.0	12.5
26	7.5	5.5	18.5	16.0	23.0	19.0	20.0	19.0	17.0	16.5	14.0	12.5
27	8.5	6.0	21.5	18.0	24.0	20.5	20.0	19.0	17.5	16.5	14.0	13.0
28	9.0	6.5	20.0	18.5	23.5	20.0	19.5	17.5	18.0	17.5	13.0	11.5
29	9.0	7.5	19.5	17.5	24.0	20.0	18.0	17.5	18.0	17.0	12.5	12.5
30	8.5	6.5	19.0	17.5	24.0	20.0	18.5	16.0	17.5	16.5	12.5	12.5
31	---	---	19.5	17.0	---	---	18.0	16.0	16.5	15.5	---	---
MONTH	9.0	.0	21.5	6.0	24.0	12.0	24.0	15.5	24.5	15.5	19.5	11.5



## STREAMS TRIBUTARY TO LAKE MICHIGAN

141

04065600 PINE CREEK NEAR IRON MOUNTAIN, MI

LOCATION.--Lat 45°55'51", long 87°58'18", in SE¼ SE¼ sec.19, T.41 N., R.29 W., Dickinson County, Hydrologic Unit 04030108, on left bank 20 ft (6 m) upstream from culvert on County Road 866, 1.2 mi (1.9 km) downstream from Steel Creek, and 9.0 mi (14.5 km) northeast of Iron Mountain.

DRAINAGE AREA.--16.8 mi<sup>2</sup> (43.5 km<sup>2</sup>).

## WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--Occasional low-flow measurements, water year 1971. October 1971 to current year.

GAGE.--Water-stage recorder. Altitude of gage is 1,034 ft (315.16 m) National Geodetic Vertical Datum of 1929, from topographic leveling (nearest 0.5 ft). Prior to Nov. 23, 1971, nonrecording gage 20 ft (6 m) downstream at same datum.

REMARKS.--Water-discharge records good except those for the winter period, which are fair. Flow includes an average of 5.4 ft<sup>3</sup>/s (0.15 m<sup>3</sup>/s) diverted from West Branch Sturgeon River Basin. Regulation and storage by reservoirs in the headwaters.

AVERAGE DISCHARGE.--5 years (water years 1972-76), 14.5 ft<sup>3</sup>/s (0.411 m<sup>3</sup>/s), 11.72 in/yr (298 mm/yr), adjusted for storage and diversion.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 272 ft<sup>3</sup>/s (7.70 m<sup>3</sup>/s) May 16, 1976, gage height, 6.42 ft (1.957 m); minimum, 0.70 ft<sup>3</sup>/s (0.020 m<sup>3</sup>/s) Aug. 11, 12, 1975; minimum gage height, 1.46 ft (0.445 m) Aug. 11, 12, 1975, and July 27, 28, Aug. 15, 1977, result of unusual regulation upstream.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 44 ft<sup>3</sup>/s (1.25 m<sup>3</sup>/s) Aug. 28, gage height, 3.07 ft (0.936 m); maximum gage height, 4.10 ft (1.250 m) Mar. 29 (backwater from ice); minimum discharge, 2.6 ft<sup>3</sup>/s (0.074 m<sup>3</sup>/s) Aug. 10, 11, gage height, 1.62 ft (0.494 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	15	7.2	6.0	9.5	6.7	4.8	11	15	11	4.9	6.1	13
2	13	8.4	6.4	9.5	6.5	4.8	10	14	11	5.9	8.1	11
3	12	16	6.4	9.5	6.2	4.8	10	14	9.5	5.2	7.1	11
4	11	21	6.0	9.5	6.0	4.8	12	13	9.3	4.6	5.9	11
5	10	17	6.0	9.5	5.6	4.8	18	12	7.9	4.3	5.5	12
6	9.1	14	6.0	9.5	5.4	4.8	22	12	7.6	4.1	4.6	11
7	8.2	14	6.0	9.5	5.2	4.8	26	12	7.2	5.2	5.9	10
8	22	14	6.0	9.5	5.0	4.8	27	12	8.1	6.2	6.1	11
9	33	14	6.0	9.5	4.8	4.8	28	15	7.8	5.1	5.1	11
10	28	17	6.0	9.5	4.8	4.8	32	15	5.7	5.3	4.2	11
11	26	15	6.0	9.5	4.8	4.8	37	14	6.7	4.1	3.8	13
12	24	12	6.0	9.5	4.8	4.8	34	13	13	4.0	3.8	13
13	19	11	6.0	9.0	4.8	4.8	34	13	11	4.1	4.1	13
14	17	10	6.0	9.0	4.8	4.8	28	32	9.1	3.5	3.8	25
15	15	11	6.0	8.6	4.8	4.8	24	29	9.0	4.2	4.7	25
16	14	11	6.0	8.5	4.8	4.8	23	25	7.9	3.5	14	20
17	13	9.6	8.0	8.4	4.8	4.8	23	20	7.5	3.6	10	16
18	12	9.0	9.5	8.2	4.8	4.8	24	16	7.3	7.5	8.7	17
19	12	8.6	9.5	8.0	4.8	4.8	25	14	6.8	11	9.1	20
20	11	11	9.5	8.0	4.8	4.8	32	13	6.0	8.9	7.3	19
21	9.8	16	9.5	7.8	4.8	4.8	30	11	5.6	6.1	6.5	17
22	9.3	16	9.5	7.6	4.8	4.9	27	11	5.2	10	7.3	14
23	8.7	12	9.5	7.5	4.8	5.0	25	10	5.0	24	27	13
24	8.3	11	9.5	7.4	4.8	5.2	25	9.9	4.5	16	25	12
25	8.1	9.5	9.5	7.3	4.8	5.4	25	9.0	4.2	12	21	11
26	8.1	8.5	9.5	7.2	4.8	5.6	23	9.1	3.8	11	17	12
27	7.9	8.0	9.5	7.0	4.8	6.8	22	9.5	4.6	8.7	20	16
28	7.6	7.5	9.5	7.0	4.8	6.6	21	18	3.6	7.1	37	14
29	7.6	6.6	9.5	6.8	---	7.4	20	16	3.4	6.7	28	20
30	7.2	6.2	9.5	6.7	---	8.5	17	15	3.5	6.1	19	23
31	6.8	---	9.5	6.7	---	10	---	13	---	5.5	15	---
TOTAL	413.7	352.1	237.8	260.7	142.6	166.2	715	454.5	212.8	218.4	350.7	445
MEAN	13.3	11.7	7.67	8.41	5.09	5.36	23.8	14.7	7.09	7.05	11.3	14.8
MAX	33	21	9.5	9.5	6.7	10	37	32	13	24	37	25
MIN	6.8	6.2	6.0	6.7	4.8	4.8	10	9.0	3.4	3.5	3.8	10

CAL YR 1977 TOTAL 3986.10 MEAN 10.9 MAX 152 MIN .92  
WTR YR 1978 TOTAL 3969.50 MEAN 10.9 MAX 37 MIN 3.4

## STREAMS TRIBUTARY TO LAKE MICHIGAN

04065600 PINE CREEK NEAR IRON MOUNTAIN, MI--CONTINUED

## WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water year 1972 to current year.

PERIOD OF DAILY RECORD.--November 1971 to current year.

INSTRUMENTATION.--Temperature recorder since Nov. 10, 1971.

REMARKS.--Temperature recorder clock stopped May 15-30 (range in temperature 8.0 to 22.0°C), June 1-18 (range in temperature 11.0 to 19.0°C), Sept. 5-12 (range in temperature 15.0 to 19.0°C). Complete ice cover during winter period.

EXTREMES FOR PERIOD OF DAILY RECORD.--

WATER TEMPERATURES: Maximum, 28.0°C July 19, 1977; minimum, 0.0°C on many days during winter periods.

EXTREMES FOR CURRENT YEAR.--

WATER TEMPERATURES: Maximum, 22.0°C June 27 and sometime during period of missing record, May 15-30; minimum, 0.0°C on many days during winter period.

## WATER QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DATE	TIME	STREAM- FLOW- INSTAN- TANEOUS (CFS)	SPE- CIFIC CON- DUCT- ANCE (MICRO- MHOS)	PH (UNITS)	TEMPER- ATURE, AIR (DEG C)	TEMPER- ATURE (DEG C)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION)
MAR 03...	1130	4.8	460	7.1	-10.0	.0	12.8	90
MAY 12...	1400	13	292	7.9	15.0	12.0	--	--
JUN 19...	1200	6.3	394	8.0	19.0	17.0	--	--
AUG 23...	1045	35	300	7.5	17.5	16.0	8.8	94
SEP 12...	1445	12	405	7.7	8.5	15.0	9.0	92

04065600 PINE CREEK NEAR IRON MOUNTAIN, MI--CONTINUED

## TEMPERATURE (DEG. C) OF WATER, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DAY	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN
	OCTOBER		NOVEMBER		DECEMBER		JANUARY		FEBRUARY		MARCH	
1	10.5	10.5	7.0	6.5	1.0	1.0	.0	.0	.0	.0	.0	.0
2	10.5	9.5	7.0	7.0	1.0	.5	.0	.0	.0	.0	.0	.0
3	9.5	9.5	7.5	7.0	.5	.5	.0	.0	.0	.0	.0	.0
4	9.5	8.5	7.5	6.5	.5	.5	.0	.0	.0	.0	.0	.0
5	9.0	8.5	6.5	6.0	.5	.0	.0	.0	.0	.0	.0	.0
6	9.0	8.5	6.0	6.0	.0	.0	.0	.0	.0	.0	.0	.0
7	8.5	7.5	6.5	6.0	.0	.0	.0	.0	.0	.0	.0	.0
8	7.5	7.5	7.0	6.5	.0	.0	.0	.0	.0	.0	.5	.0
9	7.5	7.5	8.0	7.0	.0	.0	.0	.0	.0	.0	.5	.5
10	7.5	7.5	8.0	6.5	.0	.0	.0	.0	.0	.0	.5	.5
11	7.5	7.5	6.5	5.0	.0	.0	.0	.0	.0	.0	.5	.5
12	7.5	7.5	5.0	4.0	.0	.0	.0	.0	.0	.0	.5	.5
13	7.5	6.5	4.0	4.0	.0	.0	.0	.0	.0	.0	.5	.5
14	6.5	6.5	4.0	3.5	.0	.0	.0	.0	.0	.0	.5	.5
15	6.5	6.5	3.5	3.0	.0	.0	.0	.0	.0	.0	.5	.5
16	6.5	6.0	3.0	3.0	.0	.0	.0	.0	.0	.0	.5	.5
17	6.0	6.0	3.0	2.5	.0	.0	.0	.0	.0	.0	.5	.5
18	6.0	6.0	2.5	2.5	.0	.0	.0	.0	.0	.0	1.0	.5
19	6.5	6.0	2.5	2.5	.0	.0	.0	.0	.0	.0	1.0	1.0
20	6.5	6.0	2.5	2.5	.0	.0	.0	.0	.0	.0	1.0	1.0
21	6.0	6.0	2.5	2.0	.0	.0	.0	.0	.0	.0	1.0	1.0
22	6.0	6.0	2.0	2.0	.0	.0	.0	.0	.0	.0	1.0	1.0
23	6.0	5.5	2.0	2.0	.0	.0	.0	.0	.0	.0	1.0	1.0
24	6.0	5.5	2.0	2.0	.0	.0	.0	.0	.0	.0	1.0	1.0
25	8.0	6.0	2.0	1.5	.0	.0	.0	.0	.0	.0	1.0	1.0
26	8.0	8.0	1.5	1.5	.0	.0	.0	.0	.0	.0	1.0	1.0
27	8.0	7.0	1.5	1.5	.0	.0	.0	.0	.0	.0	1.0	1.0
28	7.0	6.5	1.5	1.0	.0	.0	.0	.0	.0	.0	1.5	1.0
29	6.5	6.0	1.0	1.0	.0	.0	.0	.0	---	---	1.5	1.5
30	6.5	6.0	1.0	1.0	.0	.0	.0	.0	---	---	1.5	1.5
31	6.5	6.5	---	---	.0	.0	.0	.0	---	---	1.5	1.5
MONTH	10.5	5.5	8.0	1.0	1.0	.0	.0	.0	.0	.0	1.5	.0

## TEMPERATURE (DEG. C) OF WATER, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DAY	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN
	APRIL		MAY		JUNE		JULY		AUGUST		SEPTEMBER	
1	1.5	1.5	8.0	6.0	---	---	19.5	18.0	16.0	14.0	16.5	15.5
2	1.5	1.5	8.0	6.5	---	---	18.0	17.5	17.0	16.0	18.0	17.0
3	1.5	1.5	9.0	7.0	---	---	19.0	17.0	17.0	15.0	18.0	17.0
4	1.5	1.5	9.0	7.5	---	---	18.5	17.0	15.5	14.0	17.0	15.0
5	1.5	1.5	9.5	8.0	---	---	20.0	17.0	16.5	14.5	---	---
6	2.0	1.5	10.0	8.0	---	---	20.5	19.5	17.5	16.0	---	---
7	2.0	2.0	10.5	8.5	---	---	20.5	19.5	18.0	16.5	---	---
8	2.0	2.0	10.5	9.5	---	---	19.5	18.0	19.5	18.0	---	---
9	2.0	2.0	10.0	9.0	---	---	19.5	17.5	19.0	16.5	---	---
10	2.0	2.0	11.0	8.0	---	---	17.5	15.0	17.0	15.0	---	---
11	2.0	2.0	12.5	10.5	---	---	17.0	13.0	18.0	15.0	---	---
12	2.5	2.0	13.0	12.0	---	---	16.5	14.5	18.5	16.0	---	---
13	2.5	2.5	12.0	9.0	---	---	18.0	16.5	20.0	17.0	15.0	14.0
14	2.5	2.5	9.0	8.0	---	---	18.5	14.5	21.5	18.5	14.0	14.0
15	3.5	2.5	---	8.0	---	---	18.5	16.5	21.5	20.0	14.0	14.0
16	4.5	3.5	---	---	---	---	18.5	15.5	20.0	19.5	13.0	13.0
17	5.5	4.5	---	---	---	---	19.5	16.0	19.5	18.0	13.0	13.0
18	5.5	5.0	---	---	---	---	19.5	19.0	18.5	18.5	13.5	13.5
19	5.0	4.5	---	---	18.5	16.0	19.5	19.0	18.5	17.5	13.5	13.5
20	4.5	4.5	---	---	18.5	18.0	19.5	19.0	17.5	14.5	13.5	13.5
21	5.5	4.5	---	---	18.0	16.0	18.5	16.5	17.5	15.5	13.5	13.5
22	6.5	4.5	---	---	17.0	14.0	16.5	14.5	18.5	17.0	12.0	12.0
23	6.5	5.5	---	---	17.0	14.5	15.0	14.5	18.0	15.5	11.5	11.5
24	6.5	5.5	---	---	17.5	15.5	16.0	14.5	16.5	16.0	11.5	11.5
25	7.5	5.5	---	---	18.0	17.5	17.0	16.5	17.0	16.5	11.0	11.0
26	7.5	6.0	---	---	20.0	18.0	17.5	17.0	18.0	17.0	11.0	11.0
27	8.5	6.5	---	---	22.0	20.0	17.5	17.0	18.0	18.0	12.0	12.0
28	9.5	7.5	---	---	21.0	18.0	17.0	14.5	18.0	17.5	11.0	11.0
29	9.5	8.0	---	---	21.5	19.0	15.0	15.0	17.5	16.5	11.0	11.0
30	9.0	7.0	---	---	21.0	18.0	15.0	13.0	17.0	16.0	11.0	11.0
31	---	---	18.5	17.0	---	---	15.0	14.0	16.0	15.0	---	---
MONTH	9.5	1.5					20.5	13.0	21.5	14.0		

## STREAMS TRIBUTARY TO LAKE MICHIGAN

04066000 MENOMINEE RIVER NEAR PEMBINE, WI

LOCATION.--Lat 45°35'56", long 87°46'32", in sec.16, T.37 N., R.28 W., Michigan Meridian, Menominee County, MI, Hydrologic Unit 04030108, on left bank 0.6 mi (1.0 km) upstream from Pemene Creek, 4.0 mi (6.4 km) west of Nathan, MI, 15 mi (24 km) southeast of Pembine, and at mile 65.8 (105.9 km).

DRAINAGE AREA.--3,240 mi<sup>2</sup> (8,390 km<sup>2</sup>), approximately.

PERIOD OF RECORD.--October 1949 to current year. Monthly discharge only for some periods, published in WSP 1307.

REVISED RECORDS.--WSP 1277: 1952.

GAGE.--Water-stage recorder. Altitude of gage is 770 ft (235 m), from river-profile map. Prior to Oct. 28, 1972, at site 0.5 mi (0.8 km) downstream at datum 15 ft (4.6 m) lower.

REMARKS.--Records good except those for winter months, which are fair. Flow regulated by powerplants and by Michigamme Reservoir, capacity, 119,950 acre-ft (148 hm<sup>3</sup>), and Peavy Pond, capacity, 33,860 acre-ft (41.7 hm<sup>3</sup>), on the Michigamme River, and by many smaller reservoirs above station.

AVERAGE DISCHARGE.--29 years, 2,956 ft<sup>3</sup>/s (83.71 m<sup>3</sup>/s).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 26,900 ft<sup>3</sup>/s (762 m<sup>3</sup>/s) May 8, 1960, gage height, 13.90 ft (4.237 m); minimum, 694 ft<sup>3</sup>/s (19.7 m<sup>3</sup>/s) Sept. 3, 1969, gage height, 1.66 ft (0.506 m).

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 7,620 ft<sup>3</sup>/s (216 m<sup>3</sup>/s) Aug. 29, gage height, 11.32 ft (3.450 m); minimum daily, 1,380 ft<sup>3</sup>/s (39.1 m<sup>3</sup>/s) Aug. 13.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	3650	2180	2480	2700	1900	1800	3290	3080	4400	2100	2160	4700
2	3170	2200	2630	2500	2200	1900	2560	3430	4440	2000	2380	4300
3	2860	2790	2400	2300	2000	1900	2580	3370	4230	2100	2460	4000
4	2500	3520	2220	2500	2100	1600	2520	3060	3270	2000	2400	3000
5	2580	3140	2560	2400	1900	1800	2470	2800	2730	1900	2160	2900
6	2600	3110	2600	2200	2000	1800	3050	2660	2740	1800	1660	3260
7	2500	3120	2500	2400	2100	1800	3960	2420	2510	1800	1850	2850
8	2690	3150	2400	2500	2100	2000	3890	2400	2530	1900	1670	2770
9	3680	3190	2400	2300	2000	1900	4000	3160	2510	2100	2220	2560
10	3620	3240	2300	2200	2000	1800	4280	3230	2140	2100	1970	2170
11	3820	3280	2300	2000	1900	1800	4130	3530	1670	2000	1880	3330
12	4480	3100	2500	2300	1900	1600	4280	3500	2830	2100	1720	3130
13	4180	2520	2700	2400	1800	1600	4190	3620	3950	2200	1380	3630
14	4140	2370	3000	2400	1800	1800	4040	4450	4100	2100	1450	5000
15	4270	2820	3200	2300	1700	2000	3670	5740	3090	2000	1890	6980
16	3380	2720	3200	2300	1800	1900	3560	5840	2860	1900	2500	6070
17	3290	2420	3100	2500	1800	1800	3440	5530	2890	1700	2480	6060
18	3530	2370	3400	2400	1900	1600	3400	5130	2680	1900	2460	5790
19	3400	2220	4000	2200	1500	1500	3510	4580	2540	2200	2190	6070
20	3310	2070	3800	1900	1700	1600	4380	4470	2470	2600	2140	5970
21	2970	2580	3300	2200	1600	1600	4360	4280	2490	2660	2310	5000
22	2930	2570	3700	2200	1700	1700	4310	3760	2400	2820	2610	4520
23	2600	2750	3700	1900	1800	1700	4170	3410	2420	3710	3240	3630
24	2480	2310	3400	1800	2000	1600	3980	3020	2130	3840	5060	3160
25	2600	2220	3000	2100	1800	2000	3550	2650	1720	3870	5580	2820
26	2500	2310	2700	2100	1800	1900	3990	2550	1810	3810	5170	2460
27	2540	2310	2800	2000	1900	2000	3830	2570	1530	3730	5930	2600
28	2520	2190	2800	2000	1900	2500	3860	3260	1900	3460	6380	2620
29	2310	2270	2700	2000	---	2700	3500	3780	1700	2920	7150	2620
30	2100	2580	2900	1800	---	2960	3390	3690	1800	2810	6600	3340
31	2130	---	2800	1800	---	3610	---	4210	---	2430	5800	---
TOTAL	95330	79620	89490	68800	52600	59770	110140	113180	80480	76560	96850	117310
MEAN	3075	2654	2887	2219	1879	1928	3671	3651	2683	2470	3124	3910
MAX	4480	3520	4000	2700	2200	3610	4380	5840	4440	3870	7150	6980
MIN	2100	2070	2220	1800	1500	1500	2470	2400	1530	1700	1380	2170
CAL YR 1977 TOTAL	814040			MEAN 2230	MAX 7270	MIN 840						
WTR YR 1978 TOTAL	1040130			MEAN 2850	MAX 7150	MIN 1380						

## STREAMS TRIBUTARY TO LAKE MICHIGAN

145

## 04067000 MENOMINEE RIVER BELOW KOSS, MI

LOCATION.--Lat 45°21'16", long 87°38'55", in sec.9, T.34 N., R.27 W., Michigan Meridian, Menominee County, Hydrologic Unit 04030108, on left bank at powerplant of Wisconsin Public Service Corp., 0.5 mi (0.8 km) upstream from Little Cedar River, 3.6 mi (5.8 km) southeast of Koss, and at mile 24.7 (39.7 km).

DRAINAGE AREA.--3,790 mi<sup>2</sup> (9,820 km<sup>2</sup>), approximately.

PERIOD OF RECORD.--July 1907 to March 1909 (published as "at Koss"), July 1913 to current year.

GAGE.--Headwater and tailwater gages and generation data entered hourly in daily log sheet by company employees. Prior to June 1913, chain gage on railroad bridge 4 mi (6.4 km) upstream.

REMARKS.--Daily discharges computed on basis of average daily load and load-discharge rating of combined hydroelectric units. Flow regulated by powerplants, and by Michigamme Reservoir, capacity, 119,950 acre-ft (148 km<sup>3</sup>), and Peavy Pond, capacity, 33,860 acre-ft (41.7 km<sup>3</sup>) on Michigamme River, and by many smaller reservoirs above station.

COOPERATION.--Records of daily discharge furnished by Wisconsin Public Service Corp. since 1913.

AVERAGE DISCHARGE.--66 years (water years 1907-08, 1913-78), 3,134 ft<sup>3</sup>/s (88.76 m<sup>3</sup>/s).

EXTREMES FOR PERIOD OF RECORD.--Maximum daily discharge, 33,000 ft<sup>3</sup>/s (935 m<sup>3</sup>/s) May 10, 1960; minimum daily, 162 ft<sup>3</sup>/s (4.59 m<sup>3</sup>/s) Sept. 15, 1931.

EXTREMES FOR CURRENT YEAR.--Maximum daily discharge, 8,950 ft<sup>3</sup>/s (253 m<sup>3</sup>/s) Sept. 16; minimum daily, 1,230 ft<sup>3</sup>/s (34.8 m<sup>3</sup>/s) Aug. 13.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	3460	2320	2720	2760	1920	1900	3520	3240	4610	1950	2520	5790
2	2990	2470	2700	2480	2300	1890	4570	3590	4970	1780	2080	4440
3	2840	2830	2310	2320	2020	1920	3300	3500	4960	1950	2250	5020
4	2590	4080	2280	2460	2190	1950	2970	3790	4420	1740	2370	3710
5	2610	3450	2080	2520	1860	1600	3240	3120	3310	1720	2060	3330
6	3500	3120	2410	2210	1980	1600	4590	2540	2250	1630	1740	3180
7	2110	3250	2460	2590	2100	1760	5130	2250	2690	1800	1630	3260
8	3200	3590	2890	2580	2120	1820	4900	2840	2520	1740	1650	2650
9	3440	3270	2650	2280	2010	2040	5320	3050	2480	2060	2010	2370
10	3710	3310	2330	2180	2070	1900	5660	3260	2290	1870	1950	2370
11	3770	3230	2330	2020	1940	1700	5800	3760	2080	1760	1890	2840
12	3980	3110	2400	2320	1870	2040	5760	4020	2420	2080	1650	3800
13	4280	3080	2780	2440	1770	1500	5590	3970	3520	1970	1230	4110
14	4100	2220	3050	2440	1800	1680	5620	5080	3560	1930	1500	5220
15	3880	2970	3230	2350	1770	2080	5020	6400	3450	1760	1870	8300
16	3680	2940	3220	2280	2010	1910	4070	7430	2640	1530	2440	8950
17	3060	2630	3100	2480	1820	1800	4280	7320	2560	1310	2740	7750
18	3410	2650	3260	2280	1910	1610	4390	6960	2730	1570	3180	7340
19	3220	2280	4000	2230	1510	1520	4680	6300	2420	2230	2610	7500
20	3370	2280	4000	1890	1760	1610	5080	6070	2520	2420	2420	7640
21	2870	2730	3260	2300	1600	1670	5730	5380	2250	2460	2290	7440
22	3010	2890	3920	2250	1780	1550	6170	5550	2070	2740	2540	5890
23	2590	3020	3770	1880	1860	1780	4970	3790	2140	3470	2760	5000
24	2550	2400	3590	1750	1970	1760	5410	3990	1970	4400	4330	3560
25	2750	2460	3040	2100	1810	1720	5280	2630	1870	4860	5390	3120
26	2570	2400	2660	2110	1790	1930	4410	2420	1680	4790	6740	2880
27	2530	2060	2820	2050	1930	1890	5440	2650	1650	4760	5620	2990
28	2680	2240	2800	2050	1900	2080	5130	4950	1680	3780	7400	3160
29	2520	2320	2780	1980	---	2540	5330	4030	1380	3780	7600	3070
30	2240	2260	3000	1830	---	2770	3830	4300	1820	2290	8710	3500
31	2260	---	2850	1890	---	3370	---	3950	---	2650	6990	---
TOTAL	95770	83860	90690	69300	53370	58890	145190	132130	80910	76780	102160	140180
MEAN	3089	2795	2925	2235	1906	1900	4840	4262	2697	2477	3295	4673
MAX	4280	4080	4000	2760	2300	3370	6170	7430	4970	4860	8710	8950
MIN	2110	2060	2080	1750	1510	1500	2970	2250	1380	1310	1230	2370
CAL YR 1977	TOTAL	864665	MEAN	2369	MAX	7870	MIN	906				
WTR YR 1978	TOTAL	1129230	MEAN	3094	MAX	8950	MIN	1230				



## STREAMS TRIBUTARY TO LAKE MICHIGAN

04067500 MENOMINEE RIVER NEAR McALLISTER, WI  
(National stream-quality accounting network station)

LOCATION.--Lat 45°19'20", long 87°39'40", in SW $\frac{1}{4}$ SE $\frac{1}{4}$  sec.17, T.33 N., R.23 E., Marinette County, Hydrologic Unit 04030108, at bridge on County Trunk Highway JJ, 2.9 mi (4.7 km) east of McAllister.

DRAINAGE AREA.--4,020 mi<sup>2</sup> (10,400 km<sup>2</sup>), approximately.

PERIOD OF RECORD.--December 1977 to September 1978.

REMARKS.--Records of instantaneous discharge furnished by the Wisconsin Public Service Corp.

## WATER QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DATE	TIME	STREAM- FLOW, INSTAN- TANEOUS (CFS)	SPE- CIFIC CON- DUCT- ANCE (MICRO- MHOS)	PH (UNITS)	TEMPER- ATURE (DEG C)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION)	COLI- FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML)	STREP- TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML)	HARD- NESS (MG/L AS CAC03)	HARD- NESS, NONCAR- BONATE (MG/L CAC03)
DEC 07...	1100	2460	220	7.9	.0	--	--	K2	K6	120	27
JAN 25...	1230	2010	205	7.3	.0	12.2	88	K8	K5	120	21
FEB 16...	1030	2200	230	7.6	.0	12.3	88	K1	K5	120	21
MAR 24...	1600	2050	320	7.9	.0	--	--	K1	K11	120	9
APR 26...	1000	3300	170	7.5	8.0	11.6	103	K4	K3	100	13
MAY 23...	0930	3460	180	7.5	17.0	9.4	101	K4	K12	95	1
JUN 21...	1000	2540	200	8.0	19.5	8.2	93	K13	45	100	19
JUL 27...	1000	4760	200	8.2	22.0	8.5	101	28	82	110	19
AUG 30...	1200	8310	170	8.0	21.0	--	--	73	58	96	13
SEP 27...	1030	3180	200	7.4	14.0	8.7	88	K25	K14	110	15

K--Results based on colony count outside the acceptable range (non-ideal colony count)

DATE	CALCIUM DIS- SOLVED (MG/L AS CA)	MAGNE- SIUM, DIS- SOLVED (MG/L AS MG)	SODIUM, DIS- SOLVED (MG/L AS NA)	SODIUM AD- SORP- TION RATIO	SODIUM PERCENT	POTAS- SIUM, DIS- SOLVED (MG/L AS K)	BICAR- BONATE (MG/L AS HC03)	CAR- BONATE (MG/L AS C03)	ALKA- LINITY (MG/L AS CAC03)	CARBON DIOXIDE DIS- SOLVED (MG/L AS C02)	SULFATE DIS- SOLVED (MG/L AS S04)
DEC 07...	27	12	2.4	.1	4	1.1	110	0	90	2.2	18
JAN 25...	28	12	3.0	.1	5	1.1	120	0	98	9.6	20
FEB 16...	28	12	2.8	.1	5	1.2	120	0	98	4.8	19
MAR 24...	28	13	3.0	.1	5	1.3	140	0	110	2.8	18
APR 26...	23	11	2.0	.1	4	1.1	110	0	90	5.6	17
MAY 23...	23	9.2	2.2	.1	5	.9	--	--	94	--	15
JUN 21...	23	11	2.4	.1	5	1.0	--	--	84	--	12
JUL 27...	24	11	2.1	.1	4	1.0	--	--	86	--	11
AUG 30...	22	10	2.0	.1	4	1.0	--	--	83	--	9.9
SEP 27...	24	11	2.4	.1	5	.9	--	--	90	--	10

STREAMS TRIBUTARY TO LAKE MICHIGAN

147

04067900 MENOMINEE RIVER NEAR McALLISTER, WI--CONTINUED

WATER-QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978--CONTINUED

DATE	CHLORIDE, DIS- SOLVED (MG/L AS CL)	FLUORIDE, DIS- SOLVED (MG/L AS F)	SILICA, DIS- SOLVED (MG/L AS SiO2)	SOLIDS, RESIDUE AT 180 DEG. C DIS- SOLVED (MG/L)	SOLIDS, SUM OF CONSTITUENTS, DIS- SOLVED (MG/L)	SOLIDS, DIS- SOLVED (TONS PER DAY)	NITRO- GEN, NO2+NO3 TOTAL (MG/L AS N)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N)	NITRO- GEN, ORGANIC TOTAL (MG/L AS N)	NITRO- GEN,AM- MONIA + ORGANIC TOTAL (MG/L AS N)
DEC 07...	3.6	.1	8.9	148	127	983	.18	.01	--	--
JAN 25...	4.7	.1	9.8	152	138	825	.27	.04	1.4	1.4
FEB 16...	2.6	.6	10	144	135	855	.24	.02	.52	.54
MAR 24...	2.8	.1	10	153	145	847	.26	.01	.26	.27
APR 26...	2.5	.0	5.8	132	117	1180	.09	.00	.55	.55
MAY 23...	2.0	.0	5.0	105	--	981	.15	.02	--	--
JUN 21...	4.2	.0	6.2	136	110	933	.10	.02	.48	.50
JUL 27...	1.9	.1	7.4	140	110	1800	.10	.01	.86	.87
AUG 30...	3.1	.0	8.2	143	106	3210	.16	.00	.86	.86
SEP 27...	3.0	.1	9.1	155	115	1330	.12	.00	.62	.62

DATE	NITRO- GEN, NH4 + ORG. SUSP. TOTAL (MG/L AS N)	NITRO- GEN, AM- MONIA + ORGANIC DIS. (MG/L AS N)	NITRO- GEN, TOTAL (MG/L AS N)	NITRO- GEN, TOTAL (MG/L AS NO3)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, DIS- SOLVED (MG/L AS P)	CARBON, ORGANIC TOTAL (MG/L AS C)	SEDI- MENT, SUS- PENDED (MG/L)	SEDI- MENT DIS- CHARGE, SUS- PENDED (T/DAY)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM
DEC 07...	--	.41	--	--	.02	.00	4.0	6	40	--
JAN 25...	.00	1.8	1.7	7.4	.02	.01	--	0	.00	--
FEB 16...	.00	.57	.78	3.5	.01	.01	1.8	1	5.9	100
MAR 24...	.00	.71	.53	2.3	.01	.00	5.2	4	22	75
APR 26...	.01	.54	.64	2.8	.02	.01	--	3	27	100
MAY 23...	--	1.2	--	--	.03	.02	7.4	10	93	80
JUN 21...	.00	.55	.60	2.7	.04	.01	9.1	6	41	100
JUL 27...	.38	.49	.97	4.3	.03	.01	--	7	90	98
AUG 30...	.04	.82	1.0	4.5	.03	.00	15	18	404	73
SEP 27...	.00	1.3	.74	3.3	.02	.01	13	7	60	86

## STREAMS TRIBUTARY TO LAKE MICHIGAN

04067500 MNOMINEE RIVER NEAR McALLISTER, WI--CONTINUED

## WATER-QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978--CONTINUED

DATE	TIME	ARSENIC TOTAL (UG/L AS AS)	ARSENIC DIS- SOLVED (UG/L AS AS)	BARIUM, TOTAL RECOV- ERABLE (UG/L AS BA)	BARIUM, DIS- SOLVED (UG/L AS BA)	CADMIUM TOTAL RECOV- ERABLE (UG/L AS CD)	CADMIUM DIS- SOLVED (UG/L AS CD)	CHRO- MIUM, TOTAL RECOV- ERABLE (UG/L AS CR)	CHRO- MIUM, DIS- SOLVED (UG/L AS CR)	COBALT, TOTAL RECOV- ERABLE (UG/L AS CO)
JAN 25...	1230	0	0	0	0	2	2	20	4	7
APR 26...	1000	1	1	0	0	0	0	<10	1	2
JUL 27...	1000	1	1	0	0	3	3	10	3	0

DATE	COBALT, DIS- SOLVED (UG/L AS CO)	COPPER, TOTAL RECOV- ERABLE (UG/L AS CU)	COPPER, DIS- SOLVED (UG/L AS CU)	IRON, TOTAL RECOV- ERABLE (UG/L AS FE)	IRON, DIS- SOLVED (UG/L AS FE)	LEAD, TOTAL RECOV- ERABLE (UG/L AS PB)	LEAD, DIS- SOLVED (UG/L AS PB)	MANGA- NESE, TOTAL RECOV- ERABLE (UG/L AS MN)	MANGA- NESE, DIS- SOLVED (UG/L AS MN)	MERCURY TOTAL RECOV- ERABLE (UG/L AS HG)
JAN 25...	6	6	3	270	150	8	6	20	10	<.5
APR 26...	0	2	2	270	120	0	0	30	20	<.5
JUL 27...	0	6	6	330	70	2	0	110	20	.5

DATE	MERCURY DIS- SOLVED (UG/L AS HG)	SELE- NIUM, TOTAL (UG/L AS SE)	SELE- NIUM, DIS- SOLVED (UG/L AS SE)	SILVER, TOTAL RECOV- ERABLE (UG/L AS AG)	SILVER, DIS- SOLVED (UG/L AS AG)	ZINC, TOTAL RECOV- ERABLE (UG/L AS ZN)	ZINC, DIS- SOLVED (UG/L AS ZN)	CARBON, ORGANIC DIS- SOLVED (MG/L AS C)	CARBON, ORGANIC SUS- PENDED TOTAL (MG/L AS C)
JAN 25...	<.5	0	0	0	0	20	10	17	--
APR 26...	<.5	0	0	0	0	10	10	8.8	.4
JUL 27...	.5	0	0	0	0	10	10	16	.1

QUALITATIVE AND ASSOCIATED QUANTITATIVE ANALYSES OF BIOLOGICAL DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
PERIPHYTON

DATE	TIME	PERI- PHYTON BIOMASS ASH WEIGHT G/SQ M	PERI- PHYTON BIOMASS TOTAL DRY WEIGHT G/SQ M	CHLOR-A PERI- PHYTON CHROMO- GRAPHIC FLUOROM (MG/M2)	CHLOR-B PERI- PHYTON CHROMO- GRAPHIC FLUOROM (MG/M2)
MAY 23...	0930	5.80	7.60	3.00	1.20
JUL 27...	1000	2.70	4.20	3.10	1.30
AUG 30...	1200	.160	.470	1.40	.410

## STREAMS TRIBUTARY TO LAKE MICHIGAN

149

04096272 BEEBE CREEK NEAR HILLSDALE, MI

LOCATION.--Lat 41°57'15", long 84°38'20", in NW¼ NE¼ sec.15, T.6 S., R.3 W., Hillsdale County, Hydrologic Unit 04050001, on right bank 20 ft (6 m) upstream from bridge on Moore Road, 1.0 mi (1.6 km) upstream from mouth, and 1.2 mi (1.9 km) northwest of Hillsdale.

DRAINAGE AREA.--42.4 mi<sup>2</sup> (109.8 km<sup>2</sup>).

PERIOD OF RECORD.--May 1974 to September 1978 (discontinued as a continuous-record station; converted to a crest-stage partial-record station).

GAGE.--Water-stage recorder. Altitude of gage is 1,070 ft (326 m) from topographic map (nearest 10 ft).

REMARKS.--Records good except those for the winter period, which are poor. Occasional regulation by Lake Belair about 5.0 mi (8.0 km) upstream from station. Several observations of water temperature were made during the year.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 462 ft<sup>3</sup>/s (13.1 m<sup>3</sup>/s) Mar. 5, 1976, gage height, 6.91 ft (2.106 m); minimum, 2.9 ft<sup>3</sup>/s (0.082 m<sup>3</sup>/s) Sept. 11, 12, 1977.

EXTREMES FOR CURRENT YEAR.--Maximum discharge 362 ft<sup>3</sup>/s (10.3 m<sup>3</sup>/s) Mar. 24, gage height, 6.46 ft (1.969 m); minimum, 4.8 ft<sup>3</sup>/s (0.136 m<sup>3</sup>/s) Sept. 11, 12, gage height, 3.75 ft (1.143 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	15	13	42	32	14	13	156	35	17	86	11	6.5
2	14	14	47	30	14	13	145	34	25	77	11	4.2
3	12	12	42	29	14	13	126	31	20	80	11	5.8
4	10	11	35	28	14	13	124	20	18	70	9.4	5.8
5	9.6	12	30	26	14	13	175	21	15	45	8.9	5.8
6	9.0	35	27	25	14	13	190	25	14	44	8.5	5.7
7	8.5	23	24	24	14	13	210	26	14	41	9.1	5.6
8	12	15	22	23	14	13	196	29	18	37	8.7	4.8
9	13	13	20	22	14	13	158	42	16	33	8.2	5.9
10	12	15	18	22	14	13	133	45	14	28	7.1	5.9
11	11	14	18	21	14	14	119	42	14	26	6.8	5.3
12	11	13	18	20	14	15	112	41	14	23	6.7	9.4
13	10	12	18	19	14	19	100	49	14	22	6.4	14
14	9.6	12	20	19	14	28	87	57	13	21	6.2	14
15	9.2	12	27	18	14	39	78	62	12	16	6.2	14
16	10	13	37	18	14	48	70	64	12	14	9.0	15
17	10	14	53	17	14	54	48	62	12	14	7.8	18
18	9.7	14	80	17	14	59	49	56	12	14	6.8	23
19	9.4	13	134	17	14	58	58	50	10	14	7.1	14
20	9.6	14	146	16	14	66	70	45	10	12	7.0	15
21	9.3	18	142	16	14	145	76	41	14	13	6.4	13
22	8.4	17	122	16	14	297	73	37	12	13	6.3	12
23	9.1	17	98	15	14	337	67	34	10	13	6.2	10
24	9.6	17	81	15	14	341	62	32	9.6	12	6.2	9.6
25	9.0	17	72	14	14	276	57	29	9.6	12	6.2	4.9
26	9.0	15	60	14	13	207	53	27	178	12	6.6	8.6
27	8.9	13	49	14	13	178	48	25	339	12	6.5	4.4
28	8.6	14	41	14	13	190	45	19	248	10	7.7	8.2
29	8.3	13	38	14	---	191	41	17	172	10	7.7	8.0
30	8.0	14	35	14	---	181	39	18	119	9.6	7.1	8.0
31	8.3	---	33	14	---	163	---	17	---	11	7.1	---
TOTAL	312.0	449	1629	603	389	3037	2964	1132	1403.2	844.6	236.8	307.4
MEAN	10.1	15.0	52.5	19.5	13.9	98.0	98.8	36.5	46.8	27.2	7.64	10.2
MAX	15	35	146	32	14	341	210	64	338	86	11	23
MIN	8.0	11	18	14	13	13	39	17	9.6	9.6	6.2	5.3
CFSM	.24	.35	1.24	.46	.23	2.31	2.33	.86	1.10	.64	.18	.24
IN.	.27	.39	1.43	.53	.34	2.66	2.60	.99	1.23	.74	.21	.27

CAI YR 1977 TOTAL 8263.3 MEAN 22.6 MAX 196 MIN 3.2 CFSM .53 IN 7.25  
WTR YR 1978 TOTAL 13307.0 MEAN 36.5 MAX 341 MIN 5.3 CFSM .86 IN 11.67

## STREAMS TRIBUTARY TO LAKE MICHIGAN

04096400 ST. JOSEPH RIVER NEAR BURLINGTON, MI

LOCATION.--Lat 42°06'10", long 85°02'25", in SW $\frac{1}{4}$  SW $\frac{1}{4}$  sec.20, T.4 S., R.6 W., Calhoun County, Hydrologic Unit 04050001, on right bank 10 ft (3 m) upstream from bridge on 13 Mile Rd., 2.0 mi (3.2 km) east of Burlington, 4.0 mi (6.4 km) downstream from Tekonsha Creek, and at mile 164 (264 km).

DRAINAGE AREA.--201 mi<sup>2</sup> (521 km<sup>2</sup>).

PERIOD OF RECORD.--October 1962 to current year.

GAGE.--Water-stage recorder. Altitude of gage is 920 ft (280 m) from topographic map (nearest 10 ft).

REMARKS.--Records good except those for the winter period, which are fair. Several observations of water temperature were made during the year.

AVERAGE DISCHARGE.--16 years, 159 ft<sup>3</sup>/s (4.503 m<sup>3</sup>/s), 10.74 in/yr (273 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,030 ft<sup>3</sup>/s (29.2 m<sup>3</sup>/s), Mar. 6, 1976, gage height, 5.31 ft (1.618 m); maximum gage height, 5.51 ft (1.679 m) Feb. 5, 1968; minimum discharge, 8.0 ft<sup>3</sup>/s (0.23 m<sup>3</sup>/s) Aug. 9, 10, 11, 1964.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 965 ft<sup>3</sup>/s (27.3 m<sup>3</sup>/s), June 27, gage height, 5.20 ft (1.585 m); minimum, 40 ft<sup>3</sup>/s (1.13 m<sup>3</sup>/s) Sept. 10, 11, 12; minimum gage height, 1.57 ft (0.479 m) Sept. 11, 12.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	121	68	138	175	110	110	671	249	127	750	99	51
2	118	68	168	165	110	110	634	236	121	780	95	48
3	111	74	171	155	110	110	610	223	121	770	106	47
4	100	77	166	145	110	110	607	213	120	695	103	46
5	92	74	158	140	110	110	636	207	117	628	94	45
6	86	72	147	135	110	110	637	203	111	569	88	44
7	82	71	144	130	110	110	662	197	110	513	86	43
8	88	79	140	125	110	110	645	195	124	452	87	42
9	87	86	135	120	110	110	638	194	126	385	85	41
10	88	85	130	115	110	110	647	192	118	329	80	41
11	87	83	130	115	110	115	644	192	108	284	74	41
12	85	81	130	115	110	120	626	204	105	255	71	44
13	83	77	145	115	110	135	597	224	104	234	68	70
14	81	74	160	115	110	163	566	252	102	218	63	88
15	79	75	175	115	110	201	528	259	98	198	61	111
16	77	82	190	115	110	216	494	258	95	180	62	103
17	75	89	221	115	110	228	460	256	94	164	62	129
18	74	96	259	115	110	232	429	258	90	151	63	152
19	75	95	327	115	110	236	416	247	85	142	62	139
20	74	99	332	115	110	262	395	241	81	134	60	123
21	72	107	344	115	110	413	375	236	79	136	57	106
22	72	108	337	115	110	532	361	221	78	134	54	94
23	73	106	325	115	110	596	358	208	77	143	52	84
24	72	105	300	115	110	640	353	195	71	134	50	77
25	70	105	275	115	110	661	345	183	70	125	50	71
26	69	102	260	110	110	729	331	171	521	126	50	65
27	68	105	240	110	110	817	315	163	922	135	51	62
28	67	88	225	110	110	812	297	155	871	127	56	61
29	66	96	210	110	---	800	282	146	705	118	60	59
30	66	98	195	110	---	749	265	138	700	109	58	57
31	65	---	185	110	---	708	---	133	---	105	54	---
TOTAL	2523	2625	6462	3790	3080	10465	14824	6449	6251	9223	2161	2194
MEAN	81.4	87.5	208	122	110	338	494	208	208	298	69.7	73.1
MAX	121	108	344	175	110	817	671	259	922	780	106	152
MIN	65	68	130	110	110	110	265	133	70	105	50	41
CFSM	.41	.44	1.04	.61	.55	1.68	2.46	1.04	1.04	1.48	.35	.36
IN.	.47	.49	1.20	.70	.57	1.94	2.74	1.19	1.16	1.71	.40	.41

CAI YR 1977 TOTAL 40983 MEAN 112 MAX 413 MIN 21 CFSM .56 IN 7.58  
WTR YR 1978 TOTAL 70047 MEAN 192 MAX 922 MIN 41 CFSM .96 IN 12.96



## STREAMS TRIBUTARY TO LAKE MICHIGAN

151

04096515 HOG CREEK NEAR ALLEN, MI

LOCATION.--Lat 41°56'55", long 84°49'40", in NE¼ SE¼ sec.13, T.6 S., R.5 W., Branch County, Hydrologic Unit 04050001, on left bank 12 ft (4 m) downstream from bridge on U.S. Highway 12, 1.0 mi (1.6 km) downstream from Little Hog Creek, and 3.1 mi (5.0 km) west of Allen.

DRAINAGE AREA.--48.7 mi<sup>2</sup> (126.1 km<sup>2</sup>).

PERIOD OF RECORD.--October 1969 to current year.

GAGE.--Water-stage recorder. Altitude of gage is 1,010 ft (308 m) from topographic map. Prior to May 23, 1970, nonrecording gage at same site and datum.

REMARKS.--Records fair. Several observations of water temperature were made during the year.

AVERAGE DISCHARGE.--9 years, 40.7 ft<sup>3</sup>/s (1.153 m<sup>3</sup>/s), 11.35 in/yr (288 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 426 ft<sup>3</sup>/s (12.1 m<sup>3</sup>/s) June 28, 1976, gage height, 5.78 ft (1.762 m); minimum, 1.2 ft<sup>3</sup>/s (0.034 m<sup>3</sup>/s) Aug. 20, 21, 1971; minimum gage height, 1.34 ft (0.408 m) Sept. 12, 1977.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 426 ft<sup>3</sup>/s (12.1 m<sup>3</sup>/s) June 28, gage height, 5.78 ft (1.762 m); minimum not determined; minimum daily, 5.8 ft<sup>3</sup>/s (0.164 m<sup>3</sup>/s) Sept. 30.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	18	12	35	37	19	17	176	56	20	140	12	7.2
2	18	14	41	36	19	17	221	50	24	110	12	7.0
3	16	13	34	35	19	17	204	46	24	100	11	6.9
4	14	12	28	34	18	17	204	44	20	98	10	6.8
5	13	12	24	33	18	17	260	42	18	92	9.6	6.8
6	12	12	24	32	18	17	290	45	17	60	9.8	6.7
7	11	12	23	31	18	17	284	44	18	56	10	6.6
8	14	12	23	29	18	17	271	43	23	52	9.8	6.7
9	15	12	23	28	18	17	248	44	22	48	9.0	6.8
10	14	13	23	27	18	17	228	42	18	43	8.2	6.8
11	13	13	24	26	18	18	215	40	16	41	7.8	6.7
12	13	13	27	25	17	20	201	42	16	39	7.6	8.0
13	13	12	30	25	17	21	185	58	17	36	7.4	11
14	12	11	35	24	17	24	168	82	15	32	7.2	13
15	11	12	45	23	17	40	150	90	14	26	7.4	13
16	11	14	55	23	17	50	133	88	14	21	9.6	10
17	11	15	70	22	17	56	118	82	13	18	8.8	11
18	11	14	80	22	17	62	107	74	12	16	7.6	13
19	11	13	105	21	17	66	104	64	10	17	7.4	12
20	10	14	117	21	17	88	117	57	12	17	7.4	10
21	10	18	129	20	17	163	136	54	14	14	7.0	9.4
22	9.6	16	120	20	17	270	138	49	13	14	6.8	8.9
23	9.6	15	110	20	17	315	129	44	11	14	7.3	9.3
24	9.9	15	96	20	17	316	118	41	11	13	7.1	7.9
25	9.9	15	84	20	17	315	107	38	10	13	7.2	7.5
26	9.6	14	74	20	17	283	95	34	173	13	7.1	7.2
27	9.6	14	64	19	17	262	83	31	366	12	7.2	7.0
28	9.6	14	54	19	17	252	75	28	412	11	8.5	6.5
29	9.1	15	48	19	---	248	67	25	340	11	8.4	6.0
30	9.1	17	41	19	---	246	61	23	238	11	7.9	5.8
31	8.8	---	39	19	---	183	---	21	---	12	7.5	---
TOTAL	365.8	409	1725	769	490	3468	4893	1521	1931	1200	261.6	250.5
MEAN	11.8	13.6	55.6	24.8	17.5	112	163	49.1	64.4	38.7	8.44	8.35
MAX	18	18	129	37	19	316	290	90	412	140	12	13
MIN	8.8	11	23	19	17	17	61	21	10	11	6.8	5.8
CFSM	.24	.28	1.14	.51	.36	2.30	3.35	1.01	1.32	.80	.17	.17
IN	.28	.31	1.32	.59	.37	2.65	3.74	1.16	1.47	.92	.20	.19

CAI YR 1977 TOTAL 10424.5 MEAN 28.6 MAX 232 MIN 3.1 CFSM .59 IN 7.96  
WTR YR 1978 TOTAL 17282.9 MEAN 47.4 MAX 412 MIN 5.8 CFSM .97 IN 13.20

## STREAMS TRIBUTARY TO LAKE MICHIGAN

04096600 COLDWATER RIVER NEAR HODUNK, MI

LOCATION.--Lat 42°01'45", long 85°06'25", in NW¼ NE¼ sec.22, T.5 S., R.7 W., Branch County, Hydrologic Unit 04050001, on downstream side of bridge on Girard Rd., 2.5 mi (4.0 km) northwest of Hodunk, and 3.5 mi (5.6 km) upstream from mouth.

DRAINAGE AREA.--293 mi<sup>2</sup> (759 km<sup>2</sup>).

PERIOD OF RECORD.--October 1962 to current year.

REVISED RECORDS.--WDR MI-76-1: 1974.

GAGE.--Water-stage recorder. Altitude of gage is 900 ft (274 m) from topographic map (nearest 10 ft). Prior to July 26, 1963, non-recording gage and crest-stage gage at same site and datum.

REMARKS.--Records good except those for the winter period, which are fair. Diurnal fluctuation caused by mills above station. Several observations of water temperature were made during the year.

AVERAGE DISCHARGE.--16 years, 231 ft<sup>3</sup>/s (6.542 m<sup>3</sup>/s), 10.71 in/yr (272 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,930 ft<sup>3</sup>/s (54.7 m<sup>3</sup>/s) June 28, 1978, (corrected), gage height, 7.77 ft (2.368 m); minimum, 6.2 ft<sup>3</sup>/s (0.18 m<sup>3</sup>/s) Sept. 26, 1964; minimum gage height, 2.28 ft (0.695 m) Oct. 4-14, 1964.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 1,930 ft<sup>3</sup>/s (54.7 m<sup>3</sup>/s) June 28, gage height, 7.77 ft (2.368 m); minimum, 41 ft<sup>3</sup>/s (1.16 m<sup>3</sup>/s) Sept. 11, 12, gage height, 2.70 ft (0.823 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT
1	258	123	174	300	180	139	1160	455	115	1290	68	52
2	189	125	209	280	175	136	1140	433	110	1140	70	52
3	77	127	220	270	175	139	1100	390	105	1010	77	53
4	71	127	206	260	175	136	1110	347	100	881	71	50
5	71	125	191	250	175	134	1170	339	98	707	68	50
6	77	127	179	240	170	132	1300	336	95	638	66	48
7	73	134	156	230	170	132	1370	293	92	575	66	46
8	104	134	144	225	170	130	1420	222	106	520	70	46
9	166	134	140	220	170	127	1350	239	108	466	68	48
10	161	144	140	215	170	130	1300	258	110	422	68	48
11	154	139	140	210	165	132	1260	298	106	384	70	45
12	146	136	140	210	165	134	1210	371	100	279	73	55
13	136	132	150	205	165	139	1150	438	84	176	61	81
14	130	127	180	200	165	169	1080	503	92	169	56	174
15	121	127	210	200	160	222	1010	501	90	162	55	171
16	116	130	260	195	160	285	959	490	86	154	58	156
17	112	134	306	195	160	333	911	468	86	146	56	151
18	110	136	403	195	160	374	869	430	94	149	55	143
19	108	134	555	190	160	433	836	322	92	141	56	77
20	108	136	611	190	160	463	809	306	108	134	58	69
21	110	139	611	190	159	707	788	290	100	139	56	64
22	112	139	587	190	154	980	779	285	98	146	52	59
23	114	136	560	190	156	1210	764	274	96	194	50	56
24	119	134	536	190	139	1270	737	249	96	181	49	53
25	119	134	506	190	141	1230	689	171	94	166	49	51
26	121	130	474	185	144	1170	566	174	569	159	49	49
27	121	121	420	185	141	1110	552	150	1570	149	50	48
28	121	125	390	185	139	1090	530	140	1910	116	61	48
29	121	123	360	185	---	1230	509	130	1490	114	59	47
30	121	125	340	180	---	1210	487	125	1270	108	56	47
31	121	---	320	180	---	1180	---	120	---	94	53	---
TOTAL	3788	3937	9818	6530	4523	16406	28915	9547	9270	11109	1874	2137
MEAN	122	131	317	211	162	529	964	308	309	358	60.5	71.2
MAX	258	144	611	300	180	1270	1420	503	1910	1290	77	174
MIN	71	121	140	180	139	127	487	120	84	94	49	45
CFSM	.42	.45	1.08	.72	.55	1.81	3.29	1.05	1.06	1.22	.21	.24
IN.	.48	.50	1.25	.83	.57	2.08	3.67	1.21	1.18	1.41	.24	.27

CAL YR 1977 TOTAL 56541 MEAN 155 MAX 618 MIN 21 CFSM .53 IN 7.18  
WTR YR 1978 TOTAL 107854 MEAN 295 MAX 1910 MIN 45 CFSM 1.01 IN 13.69

STREAMS TRIBUTARY TO LAKE MICHIGAN

153

04096900 NOTTAWA CREEK NEAR ATHENS, MI

LOCATION.--Lat 42°03'20", long 85°18'30", in NW¼ sec.12, T.5 S., R.9 W., St. Joseph County, Hydrologic Unit 04050001, on right bank at downstream side of bridge on Shorts Road, 4.2 mi (6.8 km) southwest of Athens, and 5.0 mi (8.0 km) downstream from Pine Creek.

DRAINAGE AREA.--162 mi² (420 km²).

PERIOD OF RECORD.--October 1966 to current year.

GAGE.--Water-stage recorder. Altitude of gage is 850 ft (259 m) from topographic map (nearest 10 ft).

REMARKS.--Records fair. Several observations of water temperature were made during the year.

AVERAGE DISCHARGE.--12 years, 141 ft³/s (3.993 m³/s), 11.82 in/yr (300 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,120 ft³/s (31.7 m³/s) June 29, 1978, gage height, 6.47 ft (1.972 m); minimum, 21 ft³/s (0.59 m³/s) July 28, 29, 30, Aug. 4, 6, 1977; minimum gage height, 0.37 ft (0.113 m) Oct. 16, 18, 20, 21, Nov. 8, 1971.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 1,120 ft³/s (31.7 m³/s) June 29, gage height, 6.47 ft (1.972 m); minimum, 48 ft³/s (1.36 m³/s) Oct. 7, Nov. 5; minimum gage height, 0.76 ft (0.232 m) Nov. 5.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	68	52	80	98	79	83	394	123	80	885	90	81
2	65	54	103	94	79	83	388	119	80	735	87	77
3	65	54	107	90	79	83	370	114	77	598	86	74
4	60	52	102	86	79	83	359	107	77	492	85	74
5	55	49	92	84	79	84	363	107	76	422	82	74
6	51	49	90	83	79	84	376	109	75	359	79	73
7	49	50	86	82	80	84	392	108	76	309	76	71
8	55	50	82	81	80	84	394	107	80	267	74	69
9	59	50	80	81	80	84	367	108	82	228	74	68
10	60	53	80	81	80	84	340	106	82	202	73	65
11	58	57	80	80	80	84	320	104	81	175	70	64
12	57	57	80	80	80	84	300	114	82	152	68	72
13	55	55	88	80	80	87	277	164	82	139	66	65
14	54	53	96	80	81	100	251	214	81	132	64	92
15	53	54	105	80	81	131	227	246	81	124	60	97
16	53	59	115	80	81	148	206	248	80	118	67	98
17	52	64	128	80	81	160	186	226	82	113	71	116
18	52	69	155	80	81	162	164	196	86	109	70	108
19	52	69	207	80	81	168	166	170	86	104	71	173
20	52	68	237	80	82	189	172	148	84	101	74	178
21	51	71	254	80	82	284	172	132	84	115	74	149
22	51	72	233	79	82	363	167	125	84	124	71	143
23	51	68	217	79	82	418	161	116	83	147	70	117
24	51	67	177	79	82	454	157	109	82	153	71	98
25	52	67	155	79	82	456	152	103	85	146	70	65
26	52	60	145	79	82	418	144	98	209	133	72	75
27	51	60	135	79	83	386	139	94	585	120	77	70
28	51	60	125	79	83	374	138	90	973	110	87	47
29	51	59	115	79	---	380	135	87	1110	101	89	65
30	49	59	110	79	---	386	129	84	1030	97	87	64
31	49	---	105	79	---	386	---	82	---	93	85	---
TOTAL	1684	1761	3964	2530	2260	6454	7506	4058	5935	7103	2340	2812
MEAN	54.3	58.7	128	81.6	80.7	208	250	131	198	229	75.5	93.7
MAX	68	72	254	98	83	456	394	248	1110	885	90	178
MIN	49	49	80	79	79	83	129	82	75	93	60	64
CFSM	.34	.36	.79	.50	.50	1.28	1.54	.81	1.22	1.41	.47	.58
IN.	.39	.40	.91	.58	.52	1.48	1.72	.93	1.36	1.63	.54	.65

CAL YR 1977 TOTAL 31527 MEAN 86.4 MAX 338 MTN 21 CFSM .53 IN 7.24  
WTR YR 1978 TOTAL 48407 MEAN 133 MAX 1110 MTN 49 CFSM .62 IN 11.12

## STREAMS TRIBUTARY TO LAKE MICHIGAN

04097170 PORTAGE RIVER NEAR VICKSBURG, MI

LOCATION.--Lat 42°06'53", long 85°29'08", in SW¼ sec.16, T.4 S., R.10 W., Kalamazoo County, Hydrologic Unit 04050001, on right bank 15 ft (5 m) upstream from bridge on W Avenue, 2.4 mi (3.9 km) east of Vicksburg.

DRAINAGE AREA.--68.2 mi<sup>2</sup> (176.6 km<sup>2</sup>).

PERIOD OF RECORD.--March 1946 to September 1951, October 1964 to current year.

GAGE.--Water-stage recorder. Datum of gage is 839.94 ft (256.014 m) National Geodetic Vertical Datum of 1929. Mar. 13, 1946 to Sept. 30, 1951, nonrecording gage at same site and datum.

REMARKS.--Records good except those for the winter period, which are fair. Several observations of water temperature were made during the year.

AVERAGE DISCHARGE.--19 years, 60.6 ft<sup>3</sup>/s (1.716 m<sup>3</sup>/s), 12.07 in/yr (307 mm/yr):

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 356 ft<sup>3</sup>/s (10.1 m<sup>3</sup>/s) Apr. 7, 1947, gage height, 5.66 ft (1.725 m); minimum, 9.8 ft<sup>3</sup>/s (0.28 m<sup>3</sup>/s) Aug. 2, 3, 1977, gage height, 3.04 ft (0.927 m).

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 217 ft<sup>3</sup>/s (6.15 m<sup>3</sup>/s) June 30, July 1, gage height, 5.35 ft (1.631 m); minimum, 25 ft<sup>3</sup>/s (0.71 m<sup>3</sup>/s) Oct. 31; minimum gage height, 3.23 ft (0.984 m) Dec. 7, June 20.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	31	26	36	36	33	37	137	60	42	213	56	36
2	31	26	38	36	33	37	139	58	41	213	54	36
3	30	26	38	35	33	37	135	56	40	202	52	36
4	29	27	37	35	33	37	137	54	38	186	50	36
5	29	27	34	35	33	37	146	54	36	165	49	36
6	29	26	31	35	34	37	154	54	34	148	48	36
7	28	26	30	35	34	38	181	52	34	134	45	35
8	30	26	29	35	35	38	175	51	37	122	42	35
9	31	26	29	35	35	38	168	51	36	112	42	35
10	30	26	29	35	35	38	158	51	34	106	41	34
11	30	28	28	35	36	39	156	50	33	99	40	34
12	30	28	28	34	36	40	148	56	33	93	38	39
13	29	27	28	34	36	42	139	68	34	89	37	43
14	29	26	32	34	36	46	129	79	32	85	36	48
15	28	27	37	34	37	50	120	81	31	81	34	53
16	28	28	42	34	37	54	113	78	31	78	37	52
17	27	29	47	34	37	56	105	75	30	76	36	81
18	27	30	52	34	37	58	99	72	30	73	36	130
19	27	29	57	34	37	62	95	69	29	70	38	129
20	27	29	57	34	37	67	93	66	29	66	38	118
21	26	31	49	34	37	91	90	68	31	76	38	114
22	26	31	47	34	37	103	85	66	31	74	37	110
23	26	31	46	33	37	115	80	64	30	76	37	105
24	26	31	44	33	37	123	78	62	30	75	37	102
25	26	31	42	33	37	120	77	60	30	73	36	97
26	26	31	40	33	37	120	73	56	73	70	36	92
27	26	31	40	33	37	122	70	54	175	69	36	89
28	26	31	39	33	37	124	67	50	209	65	38	85
29	26	31	38	33	---	134	64	48	214	63	37	81
30	26	31	38	33	---	132	62	46	215	61	37	78
31	26	---	37	33	---	132	---	45	---	58	37	---
TOTAL	866	853	1199	1058	1000	2204	3473	1854	1722	3171	1255	2035
MEAN	27.9	28.4	38.7	34.1	35.7	71.1	116	59.8	57.4	102	40.5	67.8
MAX	31	31	57	36	37	134	181	81	215	213	56	130
MIN	26	26	28	33	33	37	62	48	29	58	34	34
CFSM	.41	.42	.57	.50	.52	1.04	1.70	.88	.84	1.50	.59	.99
IN.	.47	.47	.65	.58	.55	1.20	1.89	1.01	.94	1.73	.68	1.11

CAL YR 1977 TOTAL 12502 MEAN 34.3 MAX 107 MIN 10 CFSM .50 IN 6.82  
WTR YR 1978 TOTAL 20690 MEAN 56.7 MAX 215 MIN 26 CFSM .83 IN 11.29

## STREAMS TRIBUTARY TO LAKE MICHIGAN

155

## 04097500 ST. JOSEPH RIVER AT THREE RIVERS, MI

LOCATION.--Lat 41°56'25", long 85°38'00", in SW¼ SE¼ sec.18, T.6 S., R.11 W., St. Joseph County, Hydrologic Unit 04050001, on right bank in Scidmore Park at Three Rivers, 250 ft (76 m) downstream from Rocky River, and at mile 112 (180 km).

DRAINAGE AREA.--1,350 mi<sup>2</sup> (3,496 km<sup>2</sup>).

PERIOD OF RECORD.--May 1953 to current year.

REVISED RECORDS.--WSP 1911: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 781.34 ft (238.152 m) National Geodetic Vertical Datum of 1929 (levels by Michigan Department of Natural Resources).

REMARKS.--Records good except those for the winter period, which are fair. Flow regulated by powerplant above station. Several observations of water temperature were made during the year.

AVERAGE DISCHARGE.--25 years, 1,088 ft<sup>3</sup>/s (30.81 m<sup>3</sup>/s), 10.94 in/yr (278 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 5,810 ft<sup>3</sup>/s (165 m<sup>3</sup>/s) Mar. 7, 1976, gage height, 9.08 ft (2.768 m); minimum daily, 78 ft<sup>3</sup>/s (2.21 m<sup>3</sup>/s) Sept. 12, 1964.

EXTREMES OUTSIDE PERIOD OF RECORD.--Maximum discharge since at least 1918, 8,260 ft<sup>3</sup>/s (234 m<sup>3</sup>/s) Apr. 27, 1950, gage height, 10.6 ft (3.23 m).

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 4,810 ft<sup>3</sup>/s (136 m<sup>3</sup>/s) June 30, July 1, gage height, 8.26 ft (2.518 m); minimum, 302 ft<sup>3</sup>/s (8.55 m<sup>3</sup>/s) Sept. 6, 7, gage height, 2.38 ft (0.725 m); minimum daily, 305 ft<sup>3</sup>/s (8.64 m<sup>3</sup>/s) Sept. 7.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1030	669	887	1000	740	800	3830	1680	930	4710	663	571
2	990	661	945	1000	740	800	3800	1610	886	4410	696	548
3	965	614	1070	980	740	800	3640	1510	868	4090	716	532
4	921	752	1250	960	740	800	3550	1460	822	3760	667	521
5	806	506	1120	970	740	800	3540	1390	590	3150	659	510
6	565	529	1060	1000	740	800	3730	1400	537	2940	612	348
7	607	648	958	1000	760	800	3820	1400	755	2710	564	305
8	656	694	732	980	760	801	3960	1380	772	2470	526	310
9	694	675	802	920	760	829	3950	1330	850	2240	542	318
10	847	667	663	800	760	860	3850	1270	787	2070	580	324
11	671	704	545	720	780	808	3780	1300	645	1760	591	335
12	816	555	735	800	780	836	3640	1340	674	1590	569	415
13	832	580	917	980	780	927	3480	1440	741	1470	569	505
14	812	695	1120	1000	780	1090	3350	1620	712	1490	616	609
15	529	823	1230	1000	780	1110	3150	1860	698	1400	590	779
16	577	762	1160	940	800	1140	2980	1990	783	1240	630	705
17	750	735	1300	860	800	1330	2810	2040	681	967	678	805
18	697	734	1420	880	780	1470	2720	1890	615	795	692	1010
19	697	793	1480	890	780	1570	2550	1730	709	882	619	1400
20	711	680	1600	900	790	1670	2410	1740	653	837	564	1290
21	661	792	1700	880	800	2160	2410	1650	728	889	407	1310
22	480	870	1700	880	820	2520	2370	1540	699	912	337	1100
23	564	831	1700	880	800	3140	2300	1430	528	987	344	1000
24	723	700	1550	860	780	3650	2130	1410	528	1010	349	1010
25	698	726	1350	760	780	4030	2040	1330	538	1030	387	958
26	663	755	1100	700	780	3990	2120	1210	730	1020	471	913
27	581	782	1000	700	800	3930	2110	1170	1640	970	414	509
28	650	823	1000	700	800	3950	1980	1040	3560	886	583	608
29	510	703	1000	700	---	3970	1850	1070	4460	874	708	708
30	496	699	1000	600	---	4020	1770	969	4720	845	668	810
31	581	---	1000	660	---	3920	---	1000	---	741	606	---
TOTAL	21780	21161	35094	26900	21690	59321	89620	45199	32839	55185	17617	22417
MEAN	703	705	1132	868	775	1914	2987	1458	1095	1780	568	747
MAX	1030	870	1700	1000	820	4030	3960	2040	4720	4710	716	1510
MTN	480	506	545	600	740	800	1770	969	528	741	337	305
CFSM	.52	.52	.84	.64	.57	1.42	2.21	1.08	.81	1.32	.42	.55
IN.	.60	.58	.97	.74	.60	1.63	2.47	1.25	.90	1.52	.49	.62

CAL YR 1977 TOTAL 297349 MEAN 815 MAX 2520 MIN 224 CFSM .60 IN 8.19  
WTR YR 1978 TOTAL 448823 MEAN 1230 MAX 4720 MTN 305 CFSM .91 IN 12.37



## STREAMS TRIBUTARY TO LAKE MICHIGAN

04097540 PRAIRIE RIVER NEAR NOTTAWA, MI

LOCATION.--Lat 41°53'18", long 85°24'34", in NW¼ SW¼ sec.6, T.7 S., R.9 W., St. Joseph County, Hydrologic Unit 04050001, on left bank 10 ft (3 m) upstream from bridge on State Highway 66, 3.0 mi (4.8 km) upstream from unnamed tributary, and 3.0 mi (4.8 km) southeast of Nottawa.

DRAINAGE AREA.--106 mi<sup>2</sup> (275 km<sup>2</sup>).

PERIOD OF RECORD.--October 1962 to current year.

GAGE.--Water-stage recorder. Altitude of gage is 850 ft (259 m) from topographic map (nearest 10 ft).

REMARKS.--Records good except those for the winter period, which are fair. Several observations of water temperature were made during the year.

AVERAGE DISCHARGE.--16 years, 87.6 ft<sup>3</sup>/s (2.481 m<sup>3</sup>/s), 11.22 in/yr (285 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 523 ft<sup>3</sup>/s (14.8 m<sup>3</sup>/s), Mar. 6, 1976, gage height, 5.66 ft (1.725 m); minimum, 11 ft<sup>3</sup>/s (0.31 m<sup>3</sup>/s), Aug. 9, 10, Sept. 8, 9, 10, 1964; minimum gage height, 1.77 ft (0.539 m) Aug. 9, 10, 1964.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 450 ft<sup>3</sup>/s (12.7 m<sup>3</sup>/s) Mar. 25, gage height, 5.37 ft (1.637 m); minimum, 22 ft<sup>3</sup>/s (0.62 m<sup>3</sup>/s) Sept. 10, gage height, 2.01 ft (0.613 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	111	56	84	94	81	82	335	134	76	120	35	30
2	109	58	103	90	81	82	320	130	77	130	35	29
3	103	59	113	86	82	82	301	126	76	137	35	28
4	95	59	115	84	82	82	309	123	74	137	34	27
5	88	58	112	82	82	82	329	123	71	132	32	26
6	82	59	108	81	82	82	357	124	69	123	31	25
7	77	59	105	79	82	81	396	123	69	112	31	25
8	78	58	100	78	82	80	408	121	74	101	32	24
9	76	57	95	78	82	80	401	119	75	93	34	24
10	74	58	95	77	82	80	382	117	74	85	34	23
11	72	58	97	77	82	80	357	116	70	78	33	23
12	70	59	98	78	83	80	329	117	70	71	31	28
13	69	58	99	78	83	79	305	128	69	65	30	40
14	67	58	101	79	84	84	281	137	67	61	29	51
15	66	58	113	79	84	95	254	142	65	57	29	57
16	68	61	124	79	84	107	231	142	64	53	30	55
17	66	64	131	79	83	116	213	140	63	50	30	51
18	64	66	141	79	83	120	203	135	61	47	31	55
19	65	65	148	80	83	121	197	128	59	44	31	52
20	64	66	158	80	83	125	190	120	57	43	31	47
21	62	68	169	80	82	166	187	115	56	44	29	44
22	62	68	167	80	82	217	184	110	54	47	27	42
23	61	68	166	80	82	315	183	105	52	55	25	41
24	60	67	150	80	82	406	180	103	50	52	24	38
25	60	67	145	80	82	444	174	99	47	49	24	35
26	59	66	135	80	82	436	168	95	72	47	25	33
27	59	64	125	81	82	402	160	90	96	47	26	32
28	58	60	120	81	82	371	152	86	119	44	29	31
29	57	63	110	81	---	358	145	83	124	41	30	30
30	56	64	105	81	---	354	139	80	120	38	31	30
31	56	---	100	81	---	346	---	78	---	37	31	---
TOTAL	2214	1849	3732	2502	2306	5635	7770	3589	2170	2240	939	1076
MEAN	71.4	61.6	120	80.7	82.4	182	259	116	72.3	72.3	30.3	35.9
MAX	111	68	169	94	84	444	408	142	124	137	35	57
MTN	56	58	84	77	81	79	139	78	47	37	24	23
CFSM	.67	.58	1.13	.76	.78	1.72	2.44	1.09	.68	.68	.29	.34
IN.	.78	.65	1.31	.88	.81	1.98	2.73	1.26	.76	.79	.33	.38

CAL YP 1977 TOTAL 27784 MEAN 76.1 MAX 209 MIN 22 CFSM .72 IN 9.75  
WTR YR 1978 TOTAL 36022 MEAN 98.7 MAX 444 MIN 23 CFSM .93 IN 12.64

STREAMS TRIBUTARY TO LAKE MICHIGAN

157

04097970 LIME LAKE OUTLET AT PANAMA, IN

LOCATION.--Lat 41°42'46", long 85°07'10", in NW¼ NW¼ sec.35, T.38 N., R.12 E., Steuben County, Hydrologic Unit 04050001, on right bank 10 ft (3 m) downstream from dam for Lime Lake, 30 ft (9 m) upstream from bridge on Orland Road, and 0.7 mile (1.1 km) northwest of Panama.

DRAINAGE AREA.--17.5 mi<sup>2</sup> (45.3 km<sup>2</sup>), of which 3.68 mi<sup>2</sup> (9.53 km<sup>2</sup>) does not contribute directly to surface runoff.

PERIOD OF RECORD.--October 1969 to current year.

GAGE.--Water-stage recorder. Datum of gage is 950.00 ft (289.560 m) National Geodetic Vertical Datum of 1929.

REMARKS.--Records fair. Occasional regulation by control structure for Lime Lake.

AVERAGE DISCHARGE.--9 years, 6.78 ft<sup>3</sup>/s (0.192 m<sup>3</sup>/s), 5.26 in/yr (134 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 34 ft<sup>3</sup>/s (0.96 m<sup>3</sup>/s) Mar. 5, 1976, gage height, 4.59 ft (1.399 m); no flow at times during 1971 and 1972.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 20 ft<sup>3</sup>/s (0.57 m<sup>3</sup>/s) Apr. 12, gage height, 4.65 ft (1.417 m); minimum daily discharge, 0.12 ft<sup>3</sup>/s (0.003 m<sup>3</sup>/s) Sept. 8.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2.3	5.0	4.2	11	8.6	9.0	12	16	11	2.0	.21	.23
2	2.2	4.9	4.2	11	8.5	8.9	12	15	11	2.8	.41	.23
3	1.9	4.9	4.2	12	8.5	9.1	13	15	10	3.2	.31	.19
4	1.8	4.9	4.3	12	8.4	9.1	14	14	9.9	3.1	.21	.16
5	1.6	4.8	4.6	11	8.3	8.9	15	14	9.7	3.1	.16	.14
6	1.5	4.7	4.9	11	8.2	8.9	16	15	7.4	3.1	.13	.16
7	1.4	4.7	4.9	11	8.1	8.8	17	15	2.4	3.2	.41	.14
8	2.0	4.7	5.1	11	8.2	8.9	17	15	.52	2.8	.88	.12
9	1.8	4.8	5.4	11	8.3	8.8	18	15	.49	2.6	.79	.14
10	1.6	4.8	5.5	11	8.5	8.8	18	15	.59	2.4	.63	.19
11	1.6	4.4	5.5	11	8.8	8.8	19	15	.73	2.2	.57	.19
12	1.3	4.1	5.6	11	9.4	9.0	19	16	.64	2.0	.50	.34
13	1.3	4.0	5.8	11	9.8	9.0	18	17	.52	1.8	.48	.49
14	1.3	3.9	6.5	11	9.9	8.8	18	17	.52	1.7	.52	.64
15	1.2	3.9	6.8	11	9.7	7.5	18	18	.68	1.5	.55	.68
16	1.2	3.9	7.0	10	9.7	7.4	18	17	.73	1.3	.49	.60
17	1.2	3.7	7.2	10	9.7	7.3	17	17	.95	1.2	.40	.68
18	1.2	3.6	8.1	9.8	9.6	7.4	18	17	.91	1.4	.40	.91
19	1.4	3.5	8.3	9.7	9.5	7.3	18	16	.95	1.2	.37	1.2
20	1.5	4.0	8.8	9.9	9.3	7.2	19	16	1.1	1.1	.31	1.2
21	1.8	3.9	9.1	9.9	9.3	8.7	19	16	1.2	1.1	.28	1.1
22	1.9	3.6	9.6	9.7	9.3	9.0	19	15	1.2	1.2	.28	.95
23	2.1	3.6	9.4	9.5	9.3	9.3	19	15	.52	1.2	.28	.86
24	2.4	3.5	9.7	9.5	9.1	9.6	18	15	.20	1.0	.23	.80
25	2.8	3.6	9.8	9.7	9.1	10	18	15	.26	.86	.23	.69
26	4.1	3.5	9.8	12	9.3	11	17	15	1.0	.78	.25	.67
27	5.0	3.4	9.8	10	9.1	11	17	14	1.6	.54	.31	.58
28	4.8	3.4	9.8	9.5	9.1	11	17	13	1.7	.42	.40	.51
29	4.8	3.3	9.9	9.1	---	11	17	12	1.6	.32	.31	.51
30	4.7	3.4	10	8.9	---	11	16	11	1.6	.20	.28	.46
31	4.8	---	11	8.6	---	12	---	11	---	.13	.25	---
TOTAL	70.5	122.4	224.8	322.8	252.6	282.5	511	467	81.61	51.45	11.83	15.76
MEAN	2.27	4.08	7.25	10.4	9.02	9.11	17.0	15.1	2.72	1.66	.38	.53
MAX	5.0	5.0	11	12	9.9	12	19	18	11	3.2	.88	1.2
MIN	1.2	3.3	4.2	8.6	8.1	7.2	12	11	.20	.13	.13	.12
CFSM	.13	.23	.41	.59	.52	.52	.97	.86	.16	.10	.02	.03
IN.	.15	.26	.48	.69	.54	.60	1.09	.99	.17	.11	.03	.03
CAL YR 1977 TOTAL	70.5	122.4	224.8	322.8	252.6	282.5	511	467	81.61	51.45	11.83	15.76
WTR YR 1978 TOTAL	2.27	4.08	7.25	10.4	9.02	9.11	17.0	15.1	2.72	1.66	.38	.53
MEAN	2.27	4.08	7.25	10.4	9.02	9.11	17.0	15.1	2.72	1.66	.38	.53
MAX	5.0	5.0	11	12	9.9	12	19	18	11	3.2	.88	1.2
MIN	1.2	3.3	4.2	8.6	8.1	7.2	12	11	.20	.13	.13	.12
CFSM	.13	.23	.41	.59	.52	.52	.97	.86	.16	.10	.02	.03
IN.	.15	.26	.48	.69	.54	.60	1.09	.99	.17	.11	.03	.03

## STREAMS TRIBUTARY TO LAKE MICHIGAN

04099000 ST. JOSEPH RIVER AT MOTTVILLE, MI

LOCATION.--Lat 41°48'03", long 85°45'22", in SW¼ sec. 6, T.8 S., R.12 W., Michigan meridian, St. Joseph County, Hydrologic Unit 04050001, on right bank 500 ft (152 m) upstream from bridge on U.S. Highway 12 at Mottville, 0.4 mi (0.6 km) downstream from Michigan Power Co. hydroelectric plant, 4 mi (6 km) upstream from Pigeon River, and at mile 96 (154 km).

DRAINAGE AREA.--1,866 mi<sup>2</sup> (4,833 km<sup>2</sup>).

PERIOD OF RECORD.--October 1923 to current year. Monthly discharge only for some periods, published in WSP 1307.

REVISED RECORDS.--WSP 1387: 1930, 1932, 1938, 1940-42, 1945. WSP 1911: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 755.3 ft (230.22 m) Michigan Power Co. datum. Prior to Oct. 1, 1951, at site 0.4 mi (0.6 km) upstream at datum 4.2 ft (1.28 m) higher.

REMARKS.--Records good except those for the winter period, which are fair. Flow regulated by powerplants above station. Several observations of water temperature were made during the year. National Weather Service gage-height telemark at station.

AVERAGE DISCHARGE.--55 years, 1,537 ft<sup>3</sup>/s (43.53 m<sup>3</sup>/s), 11.19 in/yr (284 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 10,700 ft<sup>3</sup>/s (303 m<sup>3</sup>/s) Apr. 27, 1950, gage height, 10.76 ft (3.280 m), present datum; minimum daily, 39 ft<sup>3</sup>/s (1.10 m<sup>3</sup>/s) Oct. 19, 1963.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 5,380 ft<sup>3</sup>/s (152 m<sup>3</sup>/s) Mar. 29, gage height, 6.95 ft (2.118 m); minimum, 205 ft<sup>3</sup>/s (5.81 m<sup>3</sup>/s) July 19, gage height, 1.35 ft (0.411 m); minimum daily, 536 ft<sup>3</sup>/s (15.2 m<sup>3</sup>/s) Oct. 16.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEH	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2000	953	1300	1700	1400	1460	5090	2530	1640	5200	1060	949
2	1720	1050	1570	1800	1400	1470	5020	2390	1540	5130	1040	732
3	1520	1030	1390	1750	1400	1430	4840	2450	1390	4840	975	797
4	1410	1110	1660	1700	1400	1440	4760	2390	1430	4470	1080	915
5	1470	890	1970	1750	1400	1450	4840	2120	1380	4060	814	947
6	1340	897	1780	1750	1450	1370	4920	2010	928	3480	863	940
7	1320	1100	1630	1800	1450	1360	5110	2190	1020	3510	1110	741
8	670	1050	1320	1750	1450	1410	5180	2180	1370	3090	736	543
9	985	1080	1340	1400	1450	1370	5270	2160	1510	2910	803	579
10	1230	1090	1180	1300	1450	1320	5200	2030	1210	2750	849	595
11	1510	1100	987	1400	1450	1400	5130	2040	1120	2610	920	775
12	1320	1100	1250	1600	1450	1370	5020	2080	1260	1930	786	616
13	1340	916	1490	1800	1450	1430	4750	2180	1230	2090	771	1120
14	1440	1090	1750	1750	1460	1660	4640	2340	1150	2040	983	1340
15	1320	1320	1730	1600	1470	1720	4550	2690	1130	1590	928	1140
16	536	1230	1740	1500	1480	1580	4210	2700	1310	1730	962	1170
17	1280	1260	1780	1550	1490	1830	3910	2830	1180	1780	987	1240
18	1190	1220	2040	1550	1500	1900	3870	2740	1120	1340	1090	1540
19	1050	1100	2100	1500	1500	1950	3740	2610	1100	1180	717	2340
20	1030	1370	2330	1500	1500	2300	3520	2530	1050	1440	945	1450
21	1470	1070	2640	1550	1500	2480	3410	2510	1100	1090	1140	1730
22	936	1530	2650	1550	1500	3150	3360	2440	1120	1170	737	1750
23	630	1510	2720	1550	1450	3600	3320	2210	1120	1500	654	1640
24	1190	1260	2680	1450	1450	4340	3090	2150	760	1570	633	1530
25	1170	1100	2590	1300	1450	4900	3000	2160	794	1470	647	1550
26	1170	1090	2160	1300	1400	5010	2970	2060	1430	1400	625	1130
27	1120	1280	1630	1300	1450	5050	2970	1790	1660	1480	630	1340
28	1050	1500	1960	1300	1490	5080	2950	1780	3380	1410	770	922
29	862	1260	2190	1200	---	5290	2850	1650	4690	1320	1100	1060
30	882	1140	1700	1000	---	5250	2790	1810	5040	1140	1070	1240
31	1020	---	1700	1350	---	5230	---	1600	---	1040	1060	---
TOTAL	37181	34696	56957	47300	40690	80600	124280	69350	46162	71760	27485	34911
MEAN	1199	1157	1837	1526	1453	2600	4143	2237	1539	2315	887	1154
MAX	2000	1530	2720	1800	1500	5290	5270	2830	5040	5200	1140	2340
MIN	536	890	987	1000	1400	1320	2790	1600	760	1040	625	579
CFSM	.64	.62	.98	.82	.78	1.39	2.22	1.20	.83	1.24	.48	.92
IN.	.74	.69	1.14	.94	.81	1.61	2.48	1.38	.92	1.43	.55	.70

CAL YR 1977 TOTAL 471190 MEAN 1291 MAX 3330 MIN 450 CFSM .69 IN 9.39  
WTR YR 1978 TOTAL 671372 MEAN 1839 MAX 5290 MIN 536 CFSM .99 IN 13.38

## STREAMS TRIBUTARY TO LAKE MICHIGAN

159

04099750 PIGEON RIVER NEAR SCOTT, IN

LOCATION.--Lat 41°44'56", long 85°34'35", in SE¼ NW¼ sec.14, T.38 N., R.8 E., Lagrange County, Hydrologic Unit 04050001, on right bank 20 ft (6 m) downstream from bridge on County Road 750 North, 1,200 ft (366 m) downstream from Page ditch, 0.7 mile (1.1 km) south of Indiana-Michigan state line, and 1.2 miles (1.9 km) northwest of Scott.

DRAINAGE AREA.--361 mi<sup>2</sup> (935 km<sup>2</sup>), of which 53.9 mi<sup>2</sup> (139.6 km<sup>2</sup>) does not contribute directly to surface runoff.

PERIOD OF RECORD.--June 1968 to current year.

REVISED RECORDS.--WSP 2111: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 815.00 ft (248.412 m) National Geodetic Vertical Datum of 1929.

REMARKS.--Records good.

AVERAGE DISCHARGE.--10 years, 337 ft<sup>3</sup>/s (9.544 m<sup>3</sup>/s), 12.68 in/yr (322 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,780 ft<sup>3</sup>/s (50.4 m<sup>3</sup>/s) Mar. 5, 1976, gage height, 7.07 ft (2.155 m); minimum daily, 42 ft<sup>3</sup>/s (1.19 m<sup>3</sup>/s) Oct. 21, 1971.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 1,550 ft<sup>3</sup>/s (43.9 m<sup>3</sup>/s) Apr. 8, gage height, 6.59 ft (2.009 m); minimum daily, 128 ft<sup>3</sup>/s (3.62 m<sup>3</sup>/s) Aug. 22.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	308	197	280	540	245	250	1400	523	328	295	171	148
2	323	212	363	520	250	245	1380	499	341	381	157	148
3	297	207	355	500	255	240	1360	480	345	447	149	149
4	276	202	329	480	260	240	1370	465	324	435	151	157
5	265	196	322	460	265	235	1430	465	312	399	172	169
6	250	193	305	445	265	230	1490	461	282	381	168	192
7	296	193	270	400	265	230	1500	457	295	377	162	290
8	250	194	260	365	270	225	1530	449	329	373	161	258
9	268	191	280	330	270	225	1470	443	311	359	154	196
10	255	184	300	300	270	220	1400	433	294	354	148	185
11	245	192	320	320	270	220	1370	426	282	327	148	184
12	237	197	340	330	270	218	1340	435	280	304	148	184
13	230	192	360	320	275	226	1290	473	280	296	149	210
14	225	187	380	300	275	265	1220	509	266	292	149	200
15	220	193	400	245	270	323	1150	528	259	277	149	196
16	230	199	425	275	270	346	1100	532	253	262	149	187
17	230	203	458	265	270	366	1040	513	252	245	146	180
18	222	198	487	260	270	385	987	498	247	231	144	175
19	222	194	521	250	270	402	952	485	241	226	141	168
20	217	200	547	245	270	449	911	479	230	221	131	168
21	215	219	566	245	265	729	861	479	225	222	129	166
22	210	217	577	240	265	1150	809	464	217	228	128	158
23	205	212	614	235	260	1300	772	446	209	241	133	151
24	202	212	629	230	260	1350	745	435	205	232	146	148
25	202	215	644	215	255	1370	715	423	202	223	205	144
26	196	216	626	200	255	1360	677	407	241	212	178	140
27	195	208	637	170	250	1370	643	391	328	199	158	136
28	192	212	630	190	250	1400	611	375	288	187	151	133
29	189	209	610	210	---	1420	581	361	266	184	149	130
30	187	210	590	220	---	1440	553	349	263	177	148	130
31	188	---	560	235	---	1420	---	338	---	172	147	---
TOTAL	7247	6054	13985	9580	7385	19849	32657	14021	8195	8759	4719	5180
MEAN	234	202	451	309	264	640	1089	452	273	283	152	173
MAX	323	219	644	540	275	1440	1530	532	345	447	205	290
MIN	187	184	260	170	245	218	553	338	202	172	128	130
CFSM	.65	.56	1.25	.86	.73	1.77	3.02	1.25	.76	.78	.42	.48
IN.	.75	.62	1.44	.99	.76	2.05	3.37	1.44	.84	.90	.49	.53
CAL YR 1977 TOTAL	109798			MEAN 301		926	MIN 102	CFSM .83	IN 11.31			
WTR YR 1978 TOTAL	137631			MEAN 377		MAX 1530	MIN 128	CFSM 1.04	IN 14.18			

## STREAMS TRIBUTARY TO LAKE MICHIGAN

## 04100222 NORTH BRANCH ELKHART RIVER AT COSPERVILLE, IN

LOCATION.--Lat 41°28'54", long 85°28'32", in NE¼ NW¼ sec.22, T.35 N., R.9 E., Noble County, Hydrologic Unit 04050001, on right bank at downstream side of bridge on County Road 900 North, 1,300 ft (396 m) downstream from Boyd ditch, 1.7 miles (2.7 km) upstream from Hustin ditch, and 3.1 miles (5.0 km) downstream from Waldron Lake.

DRAINAGE AREA.--142 mi<sup>2</sup> (368 km<sup>2</sup>).

PERIOD OF RECORD.--October 1971 to current year. October 1950 to September 1971 at site 3.1 miles (5.0 km) upstream, published as North Branch Elkhart River near Cosperville. Records may not be equivalent.

GAGE.--Water-stage recorder. Datum of gage is 880.12 ft (268.261 m) National Geodetic Vertical Datum of 1929 (levels by State of Indiana, Department of Natural Resources).

REMARKS.--Records good except those for the winter period, which are fair. Flow regulated at times by dam at Waldron Lake.

AVERAGE DISCHARGE.--7 years, 129 ft<sup>3</sup>/s (3.653 m<sup>3</sup>/s), 12.34 in/yr (313 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 682 ft<sup>3</sup>/s (19.3 m<sup>3</sup>/s) Apr. 7, 1978, gage height, 7.41 ft (2.259 m); minimum daily, 2.4 ft<sup>3</sup>/s (0.068 m<sup>3</sup>/s) Nov. 21, 1971.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 682 ft<sup>3</sup>/s (19.3 m<sup>3</sup>/s) Apr. 7, gage height, 7.41 ft (2.259 m); minimum daily, 3.0 ft<sup>3</sup>/s (0.085 m<sup>3</sup>/s) Aug. 24.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	99	62	170	199	98	80	643	235	126	47	24	18
2	105	66	191	192	107	77	635	220	117	62	23	16
3	101	66	199	189	112	75	627	205	109	77	23	14
4	92	66	195	176	119	70	632	197	100	76	29	13
5	84	64	192	155	129	66	643	192	92	66	25	12
6	79	62	180	160	130	62	656	188	85	54	22	11
7	75	62	160	153	129	60	677	184	91	48	23	10
8	86	61	138	146	134	60	675	179	97	42	25	9.2
9	91	60	138	132	138	60	662	171	94	40	25	9.3
10	92	58	148	100	137	61	645	166	89	37	25	9.6
11	86	59	153	110	140	65	635	163	81	33	24	8.5
12	77	65	158	120	138	73	614	163	78	30	24	9.6
13	75	63	169	119	134	80	588	180	79	31	25	16
14	73	64	170	116	134	102	561	199	75	32	24	22
15	71	68	193	113	126	135	532	224	71	30	22	26
16	68	90	223	105	120	171	502	241	66	28	21	26
17	68	119	241	102	113	198	476	249	63	25	21	30
18	68	137	253	97	113	215	457	248	63	23	20	38
19	72	146	262	96	115	226	436	247	62	21	17	42
20	71	155	267	94	117	257	416	239	59	20	4.5	40
21	70	156	266	94	118	454	401	236	52	21	7.0	37
22	70	156	257	94	119	562	382	231	48	51	7.6	33
23	70	152	260	93	119	614	367	223	45	62	6.8	38
24	66	148	265	91	119	623	351	214	42	61	3.0	64
25	65	149	262	90	101	623	335	203	41	54	4.8	88
26	64	149	262	159	88	629	318	192	45	47	8.1	97
27	62	149	255	151	85	642	300	179	53	41	11	106
28	60	145	252	118	82	650	282	167	53	37	17	111
29	57	142	242	102	---	661	266	156	49	31	19	110
30	55	143	216	93	---	661	251	147	45	29	19	107
31	55	---	206	93	---	654	---	138	---	26	19	---
TOTAL	2327	3082	6543	3852	3314	8966	14965	6176	2170	1282	568.8	1171.2
MEAN	75.1	103	211	124	118	289	499	199	72.3	41.4	18.3	39.0
MAX	105	156	267	199	140	661	677	249	126	77	29	111
MIN	55	58	138	90	82	60	251	138	41	20	3.0	8.5
CFSM	.53	.73	1.49	.87	.83	2.04	3.51	1.40	.51	.29	.13	.28
IN.	.61	.81	1.71	1.01	.87	2.35	3.92	1.62	.57	.34	.15	.31

CAL YR 1977 TOTAL 41822.0 MEAN 115 MAX 366 MIN 10 CFSM .81 IN 10.96  
WTR YR 1978 TOTAL 54417.0 MEAN 149 MAX 677 MIN 3.0 CFSM 1.05 IN 14.26



## 04100500 ELKHART RIVER AT GOSHEN, IN

LOCATION.--Lat 41°35'36", long 85°50'55", in NE¼ NE¼ sec.8, T.36 N., R.6 E., Elkhart County, Hydrologic Unit 04050001, on right bank 20 ft (6 m) downstream from River Avenue bridge at Goshen, 0.4 mile (0.6 km) upstream from Rock Run, and at mile 16.1 (25.9 km).

DRAINAGE AREA.--594 mi<sup>2</sup> (1,538 km<sup>2</sup>).

PERIOD OF RECORD.--April 1931 to current year.

REVISED RECORDS.--WSP 1337: 1939(M). WSP 1557: 1954. WSP 2111: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 769.43 ft (234.522 m) National Geodetic Vertical Datum of 1929. Prior to Nov. 20, 1931, nonrecording gage at same site and datum.

REMARKS.--Records good.

AVERAGE DISCHARGE.--47 years, 503 ft<sup>3</sup>/s (14.24 m<sup>3</sup>/s), 11.50 in/yr (292 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 5,440 ft<sup>3</sup>/s (154 m<sup>3</sup>/s) Apr. 4, 1950, gage height, 10.15 ft (3.094 m); maximum gage height, 10.33 ft (3.149 m) July 10, 1951; minimum daily discharge, 7.0 ft<sup>3</sup>/s (0.20 m<sup>3</sup>/s) Aug. 11, 1964, result of extreme regulation.

EXTREMES FOR CURRENT YEAR.--Peak discharge above base of 1,800 ft<sup>3</sup>/s (51.0 m<sup>3</sup>/s) and maximum (\*):

Date	Time	Discharge (ft <sup>3</sup> /s) (m <sup>3</sup> /s)	Gage height (ft) (m)	Date	Time	Discharge (ft <sup>3</sup> /s) (m <sup>3</sup> /s)	Gage height (ft) (m)
Mar. 23	0200	*4410 125	*9.76 2.975	Apr. 7	2400	3210 90.9	7.83 2.387

Minimum daily discharge, 115 ft<sup>3</sup>/s (3.26 m<sup>3</sup>/s) Aug. 26.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	480	265	566	750	260	332	2400	812	449	228	183	146
2	550	272	976	684	270	330	2280	771	435	291	175	142
3	541	291	946	571	280	324	2230	736	405	332	174	138
4	488	278	758	635	290	315	2420	713	381	318	169	133
5	459	272	652	640	304	310	2740	709	359	293	164	129
6	436	269	624	607	320	312	2740	686	338	273	163	124
7	419	284	521	575	330	295	3150	652	345	257	166	125
8	421	254	384	566	350	305	2890	637	366	249	183	123
9	427	247	419	498	350	310	2490	620	349	235	180	122
10	421	245	460	352	350	320	2260	586	328	230	170	120
11	413	243	532	429	350	330	2170	570	312	217	166	118
12	394	251	515	500	336	350	2120	576	305	205	166	119
13	381	249	585	520	345	384	1960	668	300	214	166	162
14	366	255	745	510	340	471	1820	789	284	224	164	129
15	358	273	1090	480	335	689	1700	809	275	214	157	128
16	346	300	1230	460	325	880	1590	844	272	199	155	129
17	335	326	1180	430	325	1020	1490	830	266	195	145	153
18	329	339	1210	410	330	1060	1440	808	263	185	138	200
19	332	342	1220	392	335	1050	1390	796	258	180	138	207
20	331	365	1190	388	340	1180	1330	793	247	171	135	205
21	323	396	1220	388	345	2550	1270	795	239	171	132	198
22	317	405	1130	380	350	4150	1220	767	223	261	132	192
23	311	400	1020	370	345	4310	1170	743	212	334	126	183
24	304	395	990	356	332	3940	1130	731	204	299	125	175
25	298	397	1010	352	332	3440	1070	703	199	278	120	182
26	293	399	950	316	328	3020	1030	665	225	257	115	193
27	279	384	850	199	330	2840	978	624	220	241	135	198
28	270	373	850	226	336	2780	933	587	214	223	130	200
29	260	376	740	241	---	2850	891	545	210	205	137	198
30	258	391	799	268	---	2760	855	503	202	199	145	200
31	261	---	824	256	---	2540	---	459	---	197	130	---
TOTAL	11401	9536	26186	13749	9163	45747	53157	21527	8685	7375	4684	4771
MEAN	368	318	845	444	327	1476	1772	694	290	238	151	159
MAX	550	405	1230	750	350	4310	3150	844	449	334	183	207
MIN	258	243	384	199	260	295	855	459	199	171	115	118
CFSM	.62	.54	1.42	.75	.55	2.49	2.98	1.17	.49	.40	.25	.27
IN.	.71	.60	1.64	.86	.57	2.86	3.33	1.35	.54	.46	.29	.30
CAL YR 1977 TOTAL	176143			MEAN 483	MAX 2490	MIN 140	CFSM .81	IN 11.03				
WTR YR 1978 TOTAL	215981			MEAN 592	MAX 4310	MIN 115	CFSM 1.00	IN 13.53				

## STREAMS TRIBUTARY TO LAKE MICHIGAN

## 04101000 ST. JOSEPH RIVER AT ELKHART, IN

LOCATION.--Lat 41°41'30", long 85°58'30", in SW¼ NE¼ sec.5, T.37 N., R.5 E., Elkhart County, Hydrologic Unit 04050001, on left bank 200 ft (61 m) downstream from mouth of Elkhart River, 200 ft (61 m) upstream from Main Street bridge in Elkhart, 2,000 ft (610 m) downstream from Christiana Creek, and 0.5 mile (0.8 km) downstream from Elkhart Hydroelectric Plant.

DRAINAGE AREA.--3,370 mi<sup>2</sup> (8,728 km<sup>2</sup>).

PERIOD OF RECORD.--August 1947 to current year. Gage heights at site 0.8 mile (1.3 km) downstream at different datum from September 1924 to March 1926 are available in the district office.

REVISED RECORDS.--WSP 2111: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 700.00 ft (213.360 m) National Geodetic Vertical Datum of 1929.

REMARKS.--Records good. The flow is regulated by Elkhart Hydroelectric Plant.

AVERAGE DISCHARGE.--31 years, 3,075 ft<sup>3</sup>/s (87.08 m<sup>3</sup>/s), 12.39 in/yr (315 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 18,400 ft<sup>3</sup>/s (521 m<sup>3</sup>/s) Apr. 5, 1950, gage height, 27.82 ft (8.480 m); minimum daily, 336 ft<sup>3</sup>/s (9.52 m<sup>3</sup>/s) Aug. 5, 1964.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 13,000 ft<sup>3</sup>/s (368 m<sup>3</sup>/s) Apr. 7, gage height, 25.13 ft (7.660 m); minimum daily, 1,010 ft<sup>3</sup>/s (28.6 m<sup>3</sup>/s) Sept. 9, 10.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2870	1730	2580	4490	3110	2360	10500	4840	2910	6480	1650	1540
2	3680	1870	3590	4550	3010	2460	10100	4430	2800	6780	1670	1220
3	2620	1850	3360	4570	2930	2350	9910	4550	2650	6650	1550	1280
4	2190	1940	3370	5200	2870	2320	9920	4340	2640	6270	1660	1310
5	2760	1640	3700	4760	2870	2280	10700	4290	2720	5710	1370	1440
6	2520	1820	3470	4090	3030	2340	10900	3810	2090	5020	1420	1310
7	2410	1820	2590	3900	3090	2370	12000	4090	2150	4800	1680	1200
8	1960	1870	2740	3840	2980	2300	11700	4030	2500	4500	1320	1090
9	2010	1820	3240	3050	2900	2320	11000	4000	2740	4030	1400	1010
10	2420	1860	3570	3110	2910	2450	10500	3830	2380	3870	1400	1010
11	2610	1930	2800	3890	2870	2470	10300	3760	2370	3690	1430	1120
12	2400	1830	2950	3890	2870	2550	9940	3820	2280	3140	1360	1150
13	2410	1910	3040	4010	2890	2970	9550	4010	2350	2910	1290	1600
14	2380	1880	4640	4100	2830	3570	9080	4500	2320	2950	1510	2140
15	2550	2050	3590	3800	2840	3700	8730	4830	2170	2500	1460	1640
16	1570	2320	4710	3330	2820	3800	8400	5000	2240	2540	1600	1730
17	2070	2070	4300	3130	2810	3940	7610	4980	2240	2620	1430	1800
18	2260	2350	4520	3090	2730	4140	7540	4960	2140	2150	1590	2150
19	1980	1830	4590	3030	2670	4200	7320	4750	2040	1890	1260	2990
20	1860	2660	4800	3010	2760	4730	6980	4570	2060	2030	1330	2570
21	2400	2140	5100	2800	2870	6490	6740	4570	1920	2020	1670	2330
22	2040	2320	5080	2890	2770	9900	6540	4400	1830	1630	1240	2380
23	1490	2760	4960	2850	2680	11100	6400	4250	1990	2490	1100	2270
24	1990	2320	4890	2760	2590	11800	6130	3970	1540	2470	1060	2130
25	2050	2280	4800	2600	2560	11500	5830	3930	1550	2330	1100	2050
26	2030	1990	4110	2760	2450	11300	5700	3770	2040	2250	1090	1830
27	1910	2410	4310	2950	2490	11000	5590	3440	2570	2220	1210	1750
28	1870	2390	5370	2920	2470	10800	5520	3330	3810	2010	1330	1760
29	1760	2510	5970	2730	---	11100	5300	3170	5490	2040	1720	1490
30	1600	2240	5930	2500	---	11100	5140	3230	6130	1810	1600	1740
31	1870	---	4940	2830	---	10800	---	2940	---	1790	1580	---
TOTAL	68540	62410	127610	107430	78670	176510	251570	128390	76660	103590	44080	51030
MEAN	2211	2080	4116	3465	2810	5694	8386	4142	2555	3342	1422	1701
MAX	3680	2760	5970	5200	3110	11800	12000	5000	6130	6780	1720	2990
MIN	1490	1640	2580	2500	2450	2280	5140	2940	1540	1630	1060	1010
CFSM	.66	.62	1.22	1.03	.83	1.69	2.49	1.23	.76	.99	.42	.51
IN.	.76	.69	1.41	1.19	.87	1.95	2.78	1.42	.85	1.14	.49	.56

CAL YR 1977 TOTAL 911840 MEAN 2498 MAX 6930 MIN 927 CFSM .74 IN 10.07  
WTR YR 1978 TOTAL 1276490 MEAN 3497 MAX 12000 MIN 1010 CFSM 1.04 IN 14.09

## 04101500 ST. JOSEPH RIVER AT NILES, MI

LOCATION.--Lat 41°49'45", long 86°15'35", in SW¼ sec. 26, T.7 S., R.17 W., Berrien County, Hydrologic Unit 04050001, on right bank 100 ft (30 m) upstream from Main Street Bridge at Niles 0.6 mi (1.0 km) downstream from dam at French Paper Co., 1 mi (2 km) upstream from Dowagiac River, at mile 44 (71 km).

DRAINAGE AREA.--3,666 mi<sup>2</sup> (9,495 km<sup>2</sup>).

PERIOD OF RECORD.--October 1930 to current year. Monthly discharge only for some periods, published in WSP 1307.

REVISED RECORDS.--WSP 1387: 1931, 1933-36, 1940-43, 1945-46(M), 1949(M). WSP 1911: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 633.02 ft (192.944 m) National Geodetic Vertical Datum of 1929. Prior to Oct. 1, 1968, at datum 2.00 ft (0.610 m) higher. Oct. 1, 1930 to Feb. 11, 1931, nonrecording gage on Main Street Bridge, and Feb. 12 to June 30, 1931, nonrecording gage 50 ft (15 m) upstream from present site (gage heights referred to NGVD). Since Apr. 13, 1970, auxiliary water-stage recorder at sewage-treatment plant, 1.1 mi (1.8 km) downstream from base gage at same datum. Oct. 1, 1943 to Apr. 12, 1970, auxiliary gage was headwater gage at hydroelectric plant at Buchanan Dam, 8 mi (13 km) downstream from base gage at different datum.

REMARKS.--Records good except those for the winter period, which are fair. Flow regulated by powerplants above station. Several observations of water temperature were made during the year.

AVERAGE DISCHARGE.--48 years, 3,162 ft<sup>3</sup>/s (89.55 m<sup>3</sup>/s), 11.71 in/yr (297 mm/yr). The figure published in the 1977 report was in error; the correct figure is 47 years, 3,149 ft<sup>3</sup>/s (89.18 m<sup>3</sup>/s), 11.66 in/yr (296 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 20,200 ft<sup>3</sup>/s (572 m<sup>3</sup>/s) Apr. 5, 1950, gage height, 15.10 ft (4.602 m), present datum; minimum daily, 420 ft<sup>3</sup>/s (11.9 m<sup>3</sup>/s) Aug. 30, 1931.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 13,600 ft<sup>3</sup>/s (385 m<sup>3</sup>/s) Mar. 24, gage height, 12.01 ft (3.661 m); minimum daily, 1,210 ft<sup>3</sup>/s (34.3 m<sup>3</sup>/s) Aug. 26.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	3070	2080	3140	3500	2350	2820	10900	5320	3060	6560	1990	1450
2	4710	1950	3500	3600	2730	2740	10700	4780	3180	7450	2120	1970
3	3180	2160	3200	3600	2650	2660	10400	4740	3190	6960	1960	1500
4	3370	2250	3500	3600	2680	2710	10400	4800	3010	6690	1730	1540
5	2530	2340	4300	3600	2620	2540	11100	4620	2990	6080	2210	1730
6	3160	1920	4320	3700	2610	2860	11800	4310	2890	5530	1520	1440
7	2850	2280	3310	3700	2700	2570	12700	4510	2560	4990	1870	1610
8	2940	2200	2950	3700	2710	2690	12800	4300	2890	5030	1960	1570
9	2190	2680	2430	3370	2750	2830	11500	4340	2870	4450	1790	1390
10	2770	2140	2340	2570	2810	2770	11000	4280	2870	4160	1790	1440
11	2740	1840	2630	2660	2790	2690	10700	4130	2660	4060	1700	1390
12	3030	2340	2390	3000	2870	2960	10200	4200	2640	3840	1820	1510
13	2710	2480	3070	3500	2810	3060	10000	4710	2920	3500	1810	1440
14	2780	2040	3500	4090	2740	3320	9370	5040	2520	2870	1540	2440
15	3000	2330	3900	3530	2830	4130	9030	5370	2390	3310	1870	2540
16	2510	2820	3900	3350	2810	4130	8660	5490	2520	2620	2110	1870
17	1880	2490	4000	3080	2810	4370	7730	5200	2730	2880	2150	2110
18	2770	2640	4500	3010	2710	5030	7900	5280	2680	2700	1710	2550
19	2610	2490	4700	3250	2730	4720	7840	5110	2470	2520	2000	2700
20	2350	2760	5000	3200	2760	5320	7360	4850	2870	2370	1610	3350
21	2440	2520	5640	3170	2520	7680	6790	4880	2810	2650	1660	2750
22	2630	2620	5620	2780	2920	11600	6740	4730	2390	2290	2020	2500
23	2090	3230	5490	3130	2800	12800	6610	4560	2390	2380	1620	2740
24	1840	2840	5340	2930	2720	13000	6550	4290	2210	2800	1620	2440
25	2320	2660	5150	3000	2880	12600	6080	4890	2120	2620	1530	2530
26	2380	2450	3750	2770	2630	11800	6000	3500	2260	2840	1210	2400
27	2430	2870	3400	2150	2790	11200	5860	4010	2520	2490	1600	1910
28	2210	2950	3500	2470	2610	11200	5770	3850	3090	2610	1920	2310
29	2130	2990	3700	2780	---	11500	5640	3410	5530	2420	1860	1540
30	1920	2610	4100	2410	---	11700	5380	3530	6090	2140	2000	2140
31	2140	---	3600	2170	---	11100	---	3860	---	2100	2000	---
TOTAL	81680	73970	119870	97370	76340	193100	263510	140890	87320	115910	56300	62430
MEAN	2635	2466	3867	3141	2726	6229	8784	4545	2911	3739	1816	2041
MAX	4710	3230	5640	4090	2920	13000	12800	5490	6090	7450	2210	3350
MIN	1840	1840	2340	2150	2350	2540	5380	3410	2120	2100	1210	1300
CFSM	.72	.67	1.06	.86	.74	1.70	2.40	1.24	.79	1.02	.50	.57
IN.	.83	.75	1.22	.99	.77	1.96	2.67	1.43	.89	1.18	.57	.63

CAL YR 1977 TOTAL 1060800 MEAN 2906 MAX 4960 MIN 1010 CFSM .79 IN 10.76  
WTR YR 1978 TOTAL 1368690 MEAN 3750 MAX 13000 MIN 1210 CFSM 1.02 IN 13.89

## STREAMS TRIBUTARY TO LAKE MICHIGAN

04101800 DOWAGIAC RIVER AT SUMNERVILLE, MI

LOCATION.--Lat 41°54'57", long 86°12'47", in SE¼ sec.30, T.6 S., R.16 W., Cass County, Hydrologic Unit 04050001, on right bank 30 ft (9 m) upstream from bridge on Indian Lake Road, 0.3 mi (0.5 km) west of Sumnerville.

DRAINAGE AREA.--255 mi<sup>2</sup> (660 km<sup>2</sup>).

PERIOD OF RECORD.--October 1960 to current year.

GAGE.--Water-stage recorder. Datum of gage is 692.62 ft (211.111 m) National Geodetic Vertical Datum of 1929.

REMARKS.--Records good. Flow regulated by millpond and lake-level control dam above station. Several observations of water temperature were made during the year.

AVERAGE DISCHARGE.--18 years, 273 ft<sup>3</sup>/s (7.731 m<sup>3</sup>/s), 14.54 in/yr (369 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,280 ft<sup>3</sup>/s (36.2 m<sup>3</sup>/s) June 26, 1968, gage height, 8.78 ft (2.676 m); minimum, 86 ft<sup>3</sup>/s (2.44 m<sup>3</sup>/s) Sept. 10, 1964; minimum gage height, 2.57 ft (0.783 m) Aug. 8, 9, 1964.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 783 ft<sup>3</sup>/s (22.2 m<sup>3</sup>/s) Apr. 6, gage height, 6.54 ft (1.993 m); minimum, 160 ft<sup>3</sup>/s (4.53 m<sup>3</sup>/s) Sept. 12, gage height, 3.29 ft (1.003 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	362	217	363	295	267	238	555	296	242	473	239	216
2	373	221	429	288	276	230	501	290	233	661	230	207
3	325	217	379	288	284	240	492	286	227	620	223	199
4	297	214	339	282	288	237	492	287	225	487	210	189
5	281	209	316	289	282	227	515	296	220	411	201	182
6	271	205	303	288	284	235	645	299	216	364	197	175
7	256	205	286	291	291	231	740	292	213	336	196	172
8	271	207	274	320	267	230	611	294	251	319	199	169
9	271	205	267	299	271	225	529	293	246	298	219	157
10	258	210	256	274	284	234	524	283	233	298	216	163
11	256	214	267	299	278	237	535	283	222	274	203	162
12	255	228	273	306	267	241	498	353	238	258	200	248
13	244	229	289	310	276	262	453	498	242	251	195	455
14	238	231	351	306	265	339	425	650	223	247	185	441
15	231	246	367	293	250	407	405	630	217	237	176	413
16	226	260	369	293	242	413	387	530	222	226	215	347
17	222	256	405	280	244	406	377	462	232	219	207	318
18	224	258	461	282	237	379	383	415	246	210	194	445
19	233	247	427	288	245	363	392	381	246	205	202	475
20	231	258	421	282	236	414	375	383	231	205	201	392
21	226	267	429	280	238	670	370	391	234	400	194	341
22	228	255	391	276	235	734	357	355	222	414	187	341
23	226	249	361	265	234	696	351	339	213	452	185	312
24	224	244	345	267	237	659	365	333	210	403	180	294
25	222	244	349	269	236	565	364	314	388	351	178	231
26	221	249	314	269	238	515	348	299	563	320	182	248
27	217	246	318	273	237	513	332	290	634	314	206	259
28	216	246	303	210	239	522	321	274	558	286	313	253
29	212	238	303	210	---	572	312	265	444	268	264	245
30	209	238	299	231	---	553	305	256	374	257	235	237
31	209	---	293	251	---	532	---	248	---	244	224	---
TOTAL	7735	7013	10547	8654	7228	12319	13259	10835	8465	10308	6456	8426
MEAN	250	234	340	279	258	397	442	350	282	333	208	281
MAX	373	267	461	320	291	734	740	650	634	661	313	495
MIN	209	205	256	210	234	225	305	248	210	205	176	162
CFSM	.98	.92	1.33	1.09	1.01	1.56	1.73	1.37	1.11	1.31	.82	1.10
IN.	1.13	1.02	1.54	1.26	1.05	1.80	1.93	1.58	1.23	1.50	.94	1.23

CAL YR 1977 TOTAL 94543 MEAN 259 MAX 644 MIN 112 CFSM 1.02 IN 13.79  
WTR YR 1978 TOTAL 111245 MEAN 305 MAX 740 MIN 162 CFSM 1.20 IN 16.23

## STREAMS TRIBUTARY TO LAKE MICHIGAN

165

## 04102500 PAW PAW RIVER AT RIVERSIDE, MI

LOCATION.--Lat 42°11'10", long 86°22'06", in SW¼ SE¼ sec.23, T.3 S., R.18 W., Berrien County, Hydrologic Unit 04050001, on left bank 40 ft (12 m) upstream from bridge on Coloma Road, 0.8 mi (1.3 km) east of Riverside.

DRAINAGE AREA.--390 mi<sup>2</sup> (1,010 km<sup>2</sup>).

PERIOD OF RECORD.--October 1951 to current year.

REVISED RECORDS.--WSP 1337: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 588.80 ft (179.466 m) National Geodetic Vertical Datum of 1929. May 10, 1966 to July 11, 1967, nonrecording gage at same site and datum.

REMARKS.--Records good except those for the winter period, which are fair. Diurnal fluctuation, principally during low flow, caused by paper mill above station. Several observations of water temperature were made during the year.

AVERAGE DISCHARGE.--27 years, 428 ft<sup>3</sup>/s (12.12 m<sup>3</sup>/s), 14.90 in/yr (378 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 2,140 ft<sup>3</sup>/s (60.6 m<sup>3</sup>/s) Feb. 6, 1968, gage height, 9.32 ft (2.841 m); maximum gage height, 9.49 ft (2.893 m) Apr. 23, 1975; minimum discharge, 99 ft<sup>3</sup>/s (2.80 m<sup>3</sup>/s) July 5, 1964, gage height, 2.66 ft (0.811 m).

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 1,230 ft<sup>3</sup>/s (34.8 m<sup>3</sup>/s) Mar. 26, 27, gage height, 8.51 ft (2.594 m); minimum, 252 ft<sup>3</sup>/s (7.14 m<sup>3</sup>/s) Sept. 11, 12, gage height, 3.92 ft (1.195 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	436	312	434	390	360	310	938	442	326	676	331	307
2	455	327	524	390	360	310	930	421	314	787	313	291
3	428	323	520	390	360	310	913	401	305	813	301	276
4	409	317	470	380	360	310	913	379	297	758	299	274
5	399	309	420	380	360	310	910	379	291	697	293	270
6	393	303	380	380	360	310	983	378	289	645	288	265
7	385	299	350	380	360	310	1140	376	275	599	282	263
8	394	298	316	380	360	310	1080	375	295	558	281	257
9	396	298	315	380	360	310	1040	377	306	490	282	257
10	388	302	325	390	360	310	1080	376	302	440	281	256
11	387	309	350	390	350	320	1120	378	294	417	278	254
12	385	313	375	390	350	330	1080	415	290	388	275	252
13	379	321	410	400	340	350	987	522	287	368	273	385
14	372	325	450	400	340	420	896	658	290	352	270	452
15	367	331	490	400	330	510	819	716	288	331	270	484
16	362	345	530	390	330	582	761	696	290	326	294	483
17	355	349	570	390	330	632	712	715	293	322	318	512
18	346	355	600	380	330	657	670	777	296	312	306	569
19	349	358	600	380	330	677	633	834	299	301	299	818
20	338	367	600	370	320	733	606	845	291	291	293	806
21	332	391	580	370	320	893	582	791	290	348	284	782
22	339	394	540	370	320	1030	556	708	285	472	282	814
23	347	390	510	360	320	1030	537	642	281	466	278	862
24	351	393	490	360	320	1050	538	586	278	478	271	852
25	355	395	470	360	310	1140	545	538	286	486	268	802
26	362	398	450	360	310	1210	537	489	432	481	267	700
27	346	394	430	360	310	1210	520	450	597	475	272	594
28	328	390	420	360	310	1170	501	412	713	452	282	494
29	320	383	410	360	---	1110	482	381	650	402	287	418
30	313	378	400	360	---	1040	462	354	618	362	306	380
31	309	---	390	360	---	968	---	340	---	336	319	---
TOTAL	11425	10367	14119	11710	9470	20162	23471	16151	10348	14629	8943	14549
MEAN	369	346	455	378	338	650	782	521	345	472	288	446
MAX	455	398	600	400	360	1210	1140	845	713	813	331	862
MIN	309	298	315	360	310	310	462	340	275	291	267	254
CFSM	.95	.89	1.17	.97	.87	1.67	2.01	1.34	.89	1.21	.74	1.25
IN.	1.09	.99	1.35	1.12	.90	1.92	2.24	1.54	.99	1.40	.85	1.39

CAL YR 1977 TOTAL 150446 MEAN 412 MAX 1110 MIN 208 CFSM 1.06 IN 14.35  
WTR YR 1978 TOTAL 165384 MEAN 453 MAX 1210 MIN 254 CFSM 1.16 IN 15.78



## STREAMS TRIBUTARY TO LAKE MICHIGAN

04102700 BLACK RIVER NEAR BANGOR, MI

LOCATION.--Lat 42°21'15", long 86°11'15", in NW¼ sec.28, T.1 S., R.16 W., Van Buren County, Hydrologic Unit 04050002, on left bank 50 ft (15 m) upstream from bridge on 66th Street, 4.9 mi (7.9 km) northwest of Bangor.

DRAINAGE AREA.--83.6 mi<sup>2</sup> (216.5 km<sup>2</sup>).

PERIOD OF RECORD.--June 1966 to current year.

GAGE.--Water-stage recorder. Altitude of gage is 610 ft (186 m) from topographic map (nearest 10 ft).

REMARKS.--Records good except those for the winter period, which are poor. Occasional regulation caused by mills above station. Several observations of water temperature were made during the year.

AVERAGE DISCHARGE.--12 years, 103 ft<sup>3</sup>/s (2.917 m<sup>3</sup>/s), 16.73 in/yr (425 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,320 ft<sup>3</sup>/s (37.4 m<sup>3</sup>/s) Apr. 19, 1975, gage height, 13.16 ft (4.011 m); minimum, 20 ft<sup>3</sup>/s (0.57 m<sup>3</sup>/s) Sept. 28, 1966, gage height, 1.83 ft (0.558 m).

EXTREMES FOR CURRENT YEAR.--Peak discharges above base of 400 ft<sup>3</sup>/s (11.3 m<sup>3</sup>/s) and maximum (\*):

Date	Time	Discharge (ft <sup>3</sup> /s) (m <sup>3</sup> /s)	Gage height (ft) (m)	Date	Time	Discharge (ft <sup>3</sup> /s) (m <sup>3</sup> /s)	Gage height (ft) (m)
Mar. 22	0300	634 18.0	9.31 2.838	June 27	0900	*803 22.7	*10.52 3.206
Apr. 7	0900	615 17.4	9.16 2.792	Sept. 19	0100	663 18.8	9.53 2.905
May 14	0900	526 14.9	8.43 2.569				

Minimum discharge, 31 ft<sup>3</sup>/s (0.88 m<sup>3</sup>/s) Sept. 11, gage height, 2.00 ft (0.610 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	73	53	156	145	100	80	285	74	43	234	51	37
2	95	62	282	140	100	80	267	70	48	291	49	36
3	83	63	234	135	95	75	250	68	47	281	51	35
4	70	58	184	135	95	75	234	66	46	225	48	35
5	61	52	149	130	95	75	226	68	43	170	45	35
6	56	49	122	150	95	75	344	68	35	130	43	34
7	51	48	100	138	95	75	591	66	44	102	41	33
8	58	48	95	130	95	75	469	66	48	87	41	32
9	65	47	95	135	90	75	348	66	52	77	40	33
10	62	48	95	140	90	75	295	65	49	78	39	33
11	60	53	95	150	90	74	280	65	45	71	38	33
12	60	63	95	140	90	77	252	106	43	64	38	132
13	58	66	120	135	90	95	209	261	43	62	38	277
14	54	63	145	135	90	157	174	510	41	60	37	380
15	52	66	170	130	90	248	147	463	40	56	35	308
16	48	80	196	125	90	289	128	384	42	52	42	239
17	46	78	264	120	85	286	116	318	46	49	42	297
18	47	73	343	120	85	260	110	266	48	47	42	538
19	52	68	337	115	85	244	109	224	46	45	44	620
20	59	77	334	115	85	297	108	184	44	45	44	447
21	64	101	365	110	85	509	111	150	42	132	42	333
22	73	95	321	110	85	611	105	121	40	198	40	286
23	64	83	273	105	85	557	99	104	39	185	39	245
24	57	81	235	105	85	513	115	94	38	160	38	207
25	56	79	200	105	80	422	121	77	52	125	37	173
26	54	79	185	105	80	354	109	72	305	97	38	136
27	58	77	175	105	80	321	96	69	737	86	38	107
28	56	74	165	100	80	313	88	68	519	74	43	89
29	50	74	160	100	---	322	83	64	318	65	42	79
30	46	73	155	100	---	301	78	55	251	59	40	73
31	47	---	150	100	---	282	---	49	---	54	38	---
TOTAL	1835	2031	5995	3808	2490	7292	5947	4381	3234	3461	1283	5332
MEAN	59.2	67.7	193	123	88.9	235	198	141	108	112	41.4	178
MAX	95	101	365	150	100	611	591	510	737	291	51	620
MIN	46	47	95	100	80	74	78	49	35	45	35	32
CFSM	.71	.81	2.31	1.47	1.06	2.81	2.37	1.69	1.29	1.34	.50	2.13
IN.	.82	.90	2.67	1.69	1.11	3.24	2.65	1.95	1.44	1.54	.57	2.37

CAL YR 1977	TOTAL	32421	MEAN	88.8	MAX	483	MIN	25	CFSM	1.06	IN	14.43
WTR YR 1978	TOTAL	47089	MEAN	129	MAX	737	MIN	32	CFSM	1.54	IN	20.95

## STREAMS TRIBUTARY TO LAKE MICHIGAN

167

04103500 KALAMAZOO RIVER AT MARSHALL, MI

LOCATION.--Lat 42°15'55", long 84°57'55", on line between sec.25 and 26, T.2 S., R.6 W., Calhoun County, Hydrologic Unit 04050003, on left bank at upstream side of bridge on U.S. Highway 27 at Marshall.

DRAINAGE AREA.--449 mi<sup>2</sup> (1,163 km<sup>2</sup>).

PERIOD OF RECORD.--October 1948 to current year. Monthly discharge only for October 1948, published in WSP 1307.

GAGE.--Water-stage recorder. Datum of gage is 877.09 ft (267.337 m) National Geodetic Vertical Datum of 1929 (levels by Michigan Department of Natural Resources). Prior to Nov. 11, 1948, nonrecording gage at same site and datum.

REMARKS.--Records good except those for period of no gage-height record, June 22 to July 13, which are fair. Diurnal fluctuation caused by powerplant above station. Several observations of water temperature were made during the year.

AVERAGE DISCHARGE.--30 years, 313 ft<sup>3</sup>/s (8.864 m<sup>3</sup>/s), 9.47 in/yr (241 mm/yr).

EXTREMS FOR PERIOD OF RECORD.--Maximum discharge, 2,130 ft<sup>3</sup>/s (60.3 m<sup>3</sup>/s) Mar. 29, 1950, gage height, 8.20 ft (2.499 m); minimum, 12 ft<sup>3</sup>/s (0.34 m<sup>3</sup>/s) Aug. 2, 1967; minimum gage height, 3.00 ft (0.914 m) May 16, 1963; minimum daily discharge, 31 ft<sup>3</sup>/s (0.88 m<sup>3</sup>/s) Aug. 16, 1964.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 1,300 ft<sup>3</sup>/s (36.8 m<sup>3</sup>/s) June 27, from correlation with nearby stations; minimum discharge, 45 ft<sup>3</sup>/s (1.27 m<sup>3</sup>/s) Sept. 7, 8; minimum gage height, 3.25 ft (0.991 m) Aug. 15, Sept. 7; minimum daily discharge, 53 ft<sup>3</sup>/s (1.50 m<sup>3</sup>/s) Sept. 9.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	230	133	220	345	210	289	745	165	280	780	285	143
2	249	222	300	326	296	267	732	254	204	680	209	187
3	225	191	400	253	266	270	703	304	230	600	305	101
4	245	78	370	317	355	229	689	409	239	500	156	163
5	189	188	330	318	232	226	710	387	271	460	194	193
6	213	185	300	333	246	299	749	297	223	450	177	162
7	199	120	270	324	249	252	772	258	275	440	264	154
8	165	251	230	246	274	267	764	308	222	400	240	157
9	276	115	200	292	310	247	719	352	281	360	180	53
10	106	224	180	269	297	289	677	220	207	330	245	110
11	252	174	200	230	267	252	644	396	252	310	209	239
12	173	115	240	363	201	275	612	259	286	280	235	273
13	217	169	300	254	309	252	579	470	252	246	71	200
14	174	283	360	215	292	302	551	534	217	241	285	248
15	197	134	350	269	229	372	526	528	249	246	201	183
16	231	175	340	327	157	382	314	515	248	200	212	270
17	104	171	390	216	265	409	466	429	199	254	212	310
18	173	251	450	339	267	381	504	331	200	221	189	290
19	260	179	540	214	251	359	438	420	232	262	83	282
20	192	163	703	238	279	456	422	374	230	203	267	274
21	184	294	711	232	272	574	441	356	244	303	197	236
22	184	204	670	207	245	704	503	463	245	203	196	166
23	212	216	544	285	272	917	451	341	245	282	82	238
24	184	144	530	256	265	991	331	329	245	299	254	179
25	197	267	438	248	262	980	435	390	250	239	179	186
26	149	161	324	245	215	917	408	313	500	117	80	223
27	152	149	393	125	233	844	375	233	1200	218	163	203
28	169	250	404	320	226	793	272	270	1100	337	294	188
29	181	197	369	218	---	704	359	293	950	208	181	173
30	186	180	388	247	---	788	446	302	860	218	168	102
31	179	---	344	298	---	762	---	231	---	157	189	---
TOTAL	6047	5583	11788	8369	7242	15139	16337	10731	10636	10044	6202	5886
MEAN	195	186	380	270	259	488	545	346	355	324	200	196
MAX	276	294	711	363	355	991	772	534	1200	780	305	310
MIN	104	78	180	125	157	276	272	165	199	117	71	53
CFSM	.43	.41	.85	.60	.58	1.09	1.21	.77	.79	.72	.45	.44
IN.	.50	.46	.98	.69	.60	1.25	1.35	.89	.88	.83	.51	.49

CAL YR 1977	TOTAL	103777	MEAN	284	MAX	829	MIN	57	CFSM	.63	IN	8.60
WTR YR 1978	TOTAL	114004	MEAN	312	MAX	1200	MIN	53	CFSM	.70	IN	9.45

## STREAMS TRIBUTARY TO LAKE MICHIGAN

04105000 BATTLE CREEK AT BATTLE CREEK, MI

LOCATION.--Lat 42°19'55", long 85°09'15", in NW¼ sec.5, T.2 S., R.7 W., Calhoun County, Hydrologic Unit 04050003, on right bank 350 ft (107 m) upstream from Emmett Street Bridge at Battle Creek, and 3.0 mi (4.8 km) upstream from mouth.

DRAINAGE AREA.--241 mi<sup>2</sup> (624 km<sup>2</sup>).

PERIOD OF RECORD.--October 1930 to September 1931, October 1932 to July 1933, January 1934 to current year. Monthly discharge only for some periods, published in WSP 1307.

REVISED RECORDS.--WSP 1387: 1931, 1944. WSP 1507: 1956.

GAGE.--Water-stage recorder. Datum of gage is 823.24 ft (250.924 m) National Geodetic Vertical Datum of 1929 (levels by Michigan Department of Natural Resources). Prior to May 14, 1951, nonrecording gage, at same site and datum.

REMARKS.--Records good except those for period of no gage-height record, Dec. 13 to Jan. 31, which are fair. Occasional slight regulation prior to November 1943. Several observations of water temperature were made during the year.

AVERAGE DISCHARGE.--45 years (water years 1931, 1935-78), 197 ft<sup>3</sup>/s (5.579 m<sup>3</sup>/s), 11.10 in/yr (282 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 3,640 ft<sup>3</sup>/s (103 m<sup>3</sup>/s) Apr. 7, 1947, gage height, 4.48 ft (1.366 m), from floodmark; minimum, 22 ft<sup>3</sup>/s (0.62 m<sup>3</sup>/s) Aug. 14, 1934; minimum gage height, about -0.5 ft (-.152 m) in July 1936 and on Aug. 31, 1939, due to opening of gates at dam forming control.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 1,270 ft<sup>3</sup>/s (36.0 m<sup>3</sup>/s) Mar. 25, gage height, 2.40 ft (0.732 m); minimum, 57 ft<sup>3</sup>/s (1.61 m<sup>3</sup>/s) Sept. 6, 7, 8, 9, 11, 12, gage height, 0.59 ft (0.180 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	99	84	134	165	101	104	847	167	122	544	81	69
2	107	87	162	150	104	104	856	158	118	441	81	66
3	104	91	176	130	104	108	901	154	115	371	87	66
4	99	91	190	115	115	104	829	150	111	316	87	75
5	93	87	190	115	110	104	748	146	108	273	87	66
6	89	87	167	130	110	104	721	154	104	242	84	57
7	85	87	142	140	105	101	730	154	104	213	81	57
8	88	87	115	150	100	101	757	154	115	182	75	57
9	93	91	90	120	105	104	766	154	118	159	75	60
10	96	94	76	76	105	101	685	150	115	141	72	63
11	96	98	80	90	110	104	616	154	104	128	72	60
12	94	98	90	120	105	111	560	180	101	115	72	78
13	94	94	120	125	100	126	512	223	98	111	69	111
14	91	94	150	125	105	142	467	273	98	107	69	150
15	91	94	145	115	110	167	422	305	98	103	66	153
16	87	101	140	105	110	190	382	338	98	98	69	144
17	84	108	160	105	100	208	349	366	98	94	69	150
18	84	115	210	110	96	208	322	360	94	87	69	164
19	84	118	290	110	98	268	300	327	94	87	78	175
20	84	126	290	110	98	278	284	300	87	84	81	190
21	84	138	250	100	100	354	273	273	84	108	78	217
22	84	142	240	100	100	460	263	257	87	118	75	220
23	84	142	230	105	100	676	252	263	87	126	69	200
24	87	142	230	98	100	1030	242	284	81	126	69	169
25	84	138	190	105	105	1200	232	273	84	118	69	145
26	84	130	130	90	100	1210	218	237	310	111	69	128
27	84	108	96	68	101	1030	208	198	480	104	63	113
28	84	115	120	74	101	865	198	172	649	98	69	103
29	84	111	150	84	---	793	185	150	730	94	78	99
30	81	108	170	94	---	811	176	138	667	87	78	95
31	81	---	170	100	---	865	---	130	---	84	72	---
TOTAL	2763	3206	5093	3424	2898	12131	14301	6742	5359	5070	2313	3500
MEAN	89.1	107	164	110	104	391	477	217	179	164	74.6	117
MAX	107	142	290	165	115	1210	901	366	730	544	87	220
MIN	81	84	76	68	96	101	176	130	81	84	63	57
CFSM	.37	.44	.68	.46	.43	1.62	1.98	.90	.74	.68	.31	.49
IN.	.43	.49	.79	.53	.45	1.87	2.21	1.04	.83	.78	.36	.54

CAL YR 1977 TOTAL 51518 MEAN 141 MAX 568 MIN 47 CFSM .59 IN 7.95  
WTR YR 1978 TOTAL 66800 MEAN 183 MAX 1210 MIN 57 CFSM .76 IN 10.31

## 04105500 KALAMAZOO RIVER NEAR BATTLE CREEK, MI

LOCATION.--Lat 42°19'26", long 85°11'51", in SW¼ sec.1, T.2 S., R.8 W., Calhoun County, Hydrologic Unit 04050003, on left bank 20 ft (6 m) upstream from bridge on Kendall Street in Battle Creek.

DRAINAGE AREA.--824 mi<sup>2</sup> (2,134 km<sup>2</sup>).

PERIOD OF RECORD.--July 1937 to current year. Monthly discharge only for some periods, published in WSP 1307.

REVISED RECORDS.--WSP 924: 1938-39. WSP 1387: 1938, 1945-46, 1948.

GAGE.--Water-stage recorder. Altitude of gage is 815 ft (248 m) from topographic map (nearest 5 ft). Prior to Oct. 1, 1957, water-stage recorder at site 4.7 mi (7.6 km) downstream at different datum. Oct. 1, 1957, to June 15, 1959, nonrecording gage at bridge 1,800 ft (549 m) upstream at different datum. June 16, 1959, to Oct. 13, 1960, nonrecording gage at present site and datum.

REMARKS.--Records poor. Diurnal fluctuation, below 1,500 ft<sup>3</sup>/s (42.5 m<sup>3</sup>/s), caused by powerplants above station. Several observations of water temperature were made during the year.

AVERAGE DISCHARGE.--41 years, 648 ft<sup>3</sup>/s (18.35 m<sup>3</sup>/s), 10.68 in/yr (271 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 7,290 ft<sup>3</sup>/s (206 m<sup>3</sup>/s) Apr. 7, 1947, gage height, 9.13 ft (2.783 m), site and datum then in use; minimum, 50 ft<sup>3</sup>/s (1.42 m<sup>3</sup>/s) Sept. 22, 1939, site then in use; minimum daily, 86 ft<sup>3</sup>/s (2.44 m<sup>3</sup>/s) Aug. 5, 1964.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 2,620 ft<sup>3</sup>/s (74.2 m<sup>3</sup>/s) June 27, gage height, 5.82 ft (1.774 m); minimum, 187 ft<sup>3</sup>/s (5.30 m<sup>3</sup>/s) Sept. 10, gage height, 2.99 ft (0.911 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	498	322	470	740	480	380	1850	580	470	1360	380	285
2	426	290	520	680	480	380	1750	520	450	1150	380	270
3	432	327	580	560	480	390	1700	510	420	1000	410	275
4	426	311	580	520	470	390	1650	520	400	800	400	212
5	383	212	580	540	470	390	1550	550	410	790	330	290
6	366	306	575	620	450	390	1550	590	410	760	310	261
7	366	300	500	680	430	400	1500	580	430	700	320	261
8	383	300	400	660	420	400	1500	510	450	620	340	266
9	377	333	350	600	440	410	1450	540	460	550	350	251
10	407	306	310	340	450	420	1450	600	440	500	330	203
11	333	344	340	380	460	430	1350	610	430	460	330	266
12	420	316	370	550	450	440	1250	700	415	430	330	445
13	407	275	480	570	430	480	1100	770	420	410	320	636
14	383	333	620	570	450	520	1050	800	393	400	300	439
15	327	389	590	510	470	580	1050	900	355	370	270	498
16	349	344	660	480	450	620	960	920	407	360	315	421
17	355	366	740	480	420	640	860	910	389	360	306	716
18	266	401	1100	480	410	650	860	850	355	380	306	716
19	316	432	1330	490	410	700	870	720	355	410	333	675
20	355	432	1400	480	420	800	830	710	366	460	261	651
21	338	445	1400	470	420	1000	790	760	372	580	360	636
22	295	458	1350	460	420	1150	800	780	377	590	280	546
23	300	407	1300	450	410	1300	790	780	377	540	290	518
24	344	430	1250	450	400	1450	740	720	383	510	233	470
25	280	400	1100	450	390	1600	650	670	360	510	316	430
26	311	430	700	400	380	1750	650	650	1700	460	270	410
27	285	330	430	300	370	1800	740	640	2200	330	216	410
28	275	380	560	320	370	1850	660	550	2020	300	355	420
29	270	410	680	380	---	1900	550	500	1820	450	338	430
30	290	430	780	430	---	1910	560	480	1570	480	300	410
31	295	---	770	460	---	1900	---	480	---	380	295	---
TOTAL	10858	10759	22815	15500	12100	27420	33060	20400	19394	17400	9874	12767
MEAN	350	359	736	500	432	885	1102	658	646	561	319	426
MAX	498	458	1400	740	480	1910	1850	920	2200	1360	410	716
MTN	266	212	310	300	370	380	550	480	355	300	216	203
CFSM	.43	.44	.89	.61	.52	1.07	1.34	.80	.78	.68	.39	.52
IN.	.49	.49	1.03	.70	.55	1.24	1.49	.92	.88	.79	.45	.58

CAI YR 1977 TOTAL 195042 MEAN 534 MAX 1610 MTN 167 CFSM .65 IN 8.81  
WTR YR 1978 TOTAL 212347 MEAN 582 MAX 2200 MTN 203 CFSM .71 IN 9.59

## STREAMS TRIBUTARY TO LAKE MICHIGAN

04105700 AUGUSTA CREEK NEAR AUGUSTA, MI

LOCATION.--Lat 42°21'12", long 85°21'14", in SW¼ sec.27, T.1 S., R.9 W., Kalamazoo County, Hydrologic Unit 04050003, on left bank 15 ft (5 m) downstream from bridge on EF Road, and 1.3 mi (2.1 km) north of Augusta.

DRAINAGE AREA.--38.9 mi<sup>2</sup> (100.8 km<sup>2</sup>).

PERIOD OF RECORD.--October 1964 to current year.

GAGE.--Water-stage recorder. Altitude of gage is 815 ft (248 m) from topographic map. Prior to June 15, 1965, nonrecording gage at same site and datum.

REMARKS.--Records good. Several observations of water temperature were made during the year.

AVERAGE DISCHARGE.--14 years, 42.2 ft<sup>3</sup>/s (1.195 m<sup>3</sup>/s), 14.73 in/yr (374 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 560 ft<sup>3</sup>/s (15.9 m<sup>3</sup>/s) June 27, 1978, gage height, 3.41 ft (1.039 m); minimum, 8.9 ft<sup>3</sup>/s (0.25 m<sup>3</sup>/s) Jan. 26, 1978, result of freezeup; minimum gage height, 0.65 ft (0.198 m) Jan. 19, 1970.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 560 ft<sup>3</sup>/s (15.9 m<sup>3</sup>/s) June 27, gage height, 3.41 ft (1.039 m); minimum, 8.9 ft<sup>3</sup>/s (0.25 m<sup>3</sup>/s) Jan. 26, result of freezeup, gage height, 0.70 ft (0.213 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	45	31	46	35	36	31	85	35	26	106	27	26
2	46	31	52	31	36	29	85	34	24	101	26	24
3	42	31	47	33	36	32	79	34	22	93	27	23
4	37	31	42	32	42	30	77	34	24	81	26	21
5	35	30	38	34	36	31	71	36	23	71	25	20
6	33	30	35	33	39	31	89	37	23	65	25	19
7	32	30	34	33	40	29	102	36	24	54	24	18
8	36	31	27	36	38	31	95	37	33	54	26	18
9	38	31	34	31	36	29	81	38	31	50	26	18
10	35	34	34	37	36	31	76	37	28	46	26	18
11	35	34	33	31	36	33	77	38	25	40	24	17
12	35	34	32	33	34	33	73	52	28	36	25	38
13	34	32	34	32	32	36	65	66	28	36	24	64
14	32	31	39	27	34	45	58	77	26	39	23	72
15	32	33	39	35	33	51	53	71	25	33	23	64
16	31	36	39	29	32	50	51	60	27	26	25	52
17	30	35	42	33	32	49	49	53	30	23	24	80
18	29	37	55	29	32	46	48	48	29	21	24	99
19	32	35	65	28	36	48	48	44	27	21	28	93
20	31	38	65	28	37	53	48	41	26	26	26	71
21	30	45	57	29	35	82	47	43	30	41	25	63
22	30	42	56	27	32	85	45	41	27	41	23	55
23	31	38	50	29	33	84	44	39	25	43	22	46
24	31	38	45	29	30	81	45	37	24	42	21	41
25	31	36	41	29	29	71	43	36	26	39	21	38
26	31	35	36	23	31	64	41	33	312	36	22	34
27	30	32	40	33	31	62	40	32	454	35	25	33
28	30	33	35	31	31	68	38	29	414	32	35	32
29	30	32	35	32	---	77	37	28	225	30	34	30
30	29	32	34	34	---	76	37	30	131	29	31	29
31	30	---	32	36	---	77	---	28	---	27	29	---
TOTAL	1033	1018	1293	972	965	1575	1827	1284	2197	1417	792	1256
MEAN	33.3	33.9	41.7	31.4	34.5	50.8	60.9	41.4	73.2	45.7	25.5	41.9
MAX	46	45	65	37	42	85	102	77	454	106	35	99
MIN	29	30	27	23	29	29	37	28	22	21	21	17
CFSM	.86	.87	1.07	.81	.89	1.31	1.57	1.06	1.88	1.18	.66	1.08
IN.	.99	.97	1.24	.93	.92	1.51	1.75	1.23	2.10	1.36	.76	1.20

CAL YR 1977 TOTAL 13548 MEAN 37.1 MAX 92 MIN 15 CFSM .95 IN 12.96  
WTR YR 1978 TOTAL 15629 MEAN 42.8 MAX 454 MIN 17 CFSM 1.10 IN 14.95



## STREAMS TRIBUTARY TO LAKE MICHIGAN

171

## 04106000 KALAMAZOO RIVER AT COMSTOCK, MI

LOCATION.--Lat 42°17'05", long 85°30'50", in NE¼ sec.19, T.2 S., R.10 W., Kalamazoo County, Hydrologic Unit 04050003, on left bank at downstream side of bridge on River Street in Comstock, 0.2 mi (0.3 km) downstream from Comstock Creek.

DRAINAGE AREA.--1,010 mi<sup>2</sup> (2,620 km<sup>2</sup>), approximately.

PERIOD OF RECORD.--April to August 1931, October 1932 to current year. Monthly discharge only for some periods, published in WSP 1307.

REVISED RECORDS.--WSP 824: 1933-36. WSP 1387: 1933, 1934(M), 1935, 1936(M), 1938(M), 1940(M), 1941.

GAGE.--Water-stage recorder. Datum of gage is 759.12 ft (231.380 m) National Geodetic Vertical Datum of 1929. Prior to November 1945, nonrecording gage at same site and datum.

REMARKS.--Records good. Flow regulated by powerplants above station. Several observations of water temperature were made during the year. National Weather Service gage-height telemark at station.

AVERAGE DISCHARGE.--46 years (water years 1933-78), 844 ft<sup>3</sup>/s (23.90 m<sup>3</sup>/s), 11.35 in/yr (288 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 6,910 ft<sup>3</sup>/s (196 m<sup>3</sup>/s) Apr. 8, 1947, gage height, 7.94 ft (2.420 m); minimum, 119 ft<sup>3</sup>/s (3.37 m<sup>3</sup>/s) May 29, 1958, gage height, 0.09 ft (0.027 m); minimum daily, 185 ft<sup>3</sup>/s (5.24 m<sup>3</sup>/s) Aug. 7, 1934.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 3,490 ft<sup>3</sup>/s (98.8 m<sup>3</sup>/s) June 28, gage height, 4.89 ft (1.490 m); minimum not determined; minimum daily, 370 ft<sup>3</sup>/s (10.5 m<sup>3</sup>/s) Sept. 8.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	661	547	673	1040	543	601	2110	842	706	2480	601	454
2	697	413	825	949	666	601	2180	830	681	2230	587	440
3	714	462	843	798	674	629	2120	689	661	1850	611	433
4	599	478	827	712	682	615	2150	770	583	1660	651	440
5	629	436	836	686	658	601	2150	787	593	1320	622	398
6	566	409	833	796	666	580	2200	895	608	1260	493	405
7	570	469	775	840	615	594	2180	861	620	1250	497	391
8	575	492	617	917	601	608	2190	814	647	1180	503	370
9	559	458	493	778	615	601	2160	733	683	1020	556	398
10	592	514	433	449	636	608	2110	888	661	895	547	433
11	543	500	472	467	666	629	2040	876	645	934	519	419
12	548	506	530	728	643	643	1930	958	614	922	533	433
13	581	534	716	756	629	666	1770	1120	625	858	516	762
14	534	541	907	767	615	722	1600	1140	635	834	475	1000
15	496	549	856	683	674	794	1570	1350	617	819	433	866
16	492	574	833	627	674	922	1480	1360	611	777	475	818
17	551	545	905	641	615	938	1330	1360	654	743	516	1010
18	586	576	1010	663	580	962	1230	1320	650	686	510	1330
19	545	607	1150	652	594	970	1250	1230	612	690	517	1220
20	517	692	1440	672	587	1070	1260	1010	599	685	538	1110
21	506	677	1520	643	587	1290	1160	1110	650	890	489	1070
22	498	716	1430	615	608	1590	1140	1140	655	952	517	938
23	489	669	1420	636	594	1720	1160	1140	635	878	510	942
24	490	659	1410	594	615	1880	1150	1170	629	801	475	874
25	543	648	1260	643	608	2180	1010	992	634	821	433	738
26	476	625	811	615	650	2430	928	951	1860	793	419	650
27	493	614	567	405	622	2600	950	953	2820	678	447	562
28	452	568	689	440	601	2590	1090	866	3400	467	447	599
29	442	586	879	496	---	2420	918	781	3140	655	503	575
30	453	611	1020	594	---	2260	741	683	2660	782	496	627
31	483	---	1050	622	---	2100	---	723	---	587	454	---
TOTAL	16880	16675	28030	20924	17618	37414	47257	30342	29788	31397	15880	20825
MEAN	545	556	904	675	629	1207	1575	979	993	1013	512	644
MAX	714	716	1520	1040	682	2600	2200	1360	3400	2480	651	1330
MIN	442	409	433	405	580	580	741	683	583	467	419	370
CFSM	.54	.55	.90	.67	.62	1.20	1.56	.97	.98	1.00	.51	.49
IN.	.62	.61	1.03	.77	.65	1.38	1.74	1.12	1.10	1.16	.58	.77

CAL YR 1977 TOTAL 259578 MEAN 711 MAX 1790 MIN 305 CFSM .70 IN 9.56  
WTR YR 1978 TOTAL 313030 MEAN 858 MAX 3400 MIN 370 CFSM .85 IN 11.53

## STREAMS TRIBUTARY TO LAKE MICHIGAN

04106300 PORTAGE CREEK NEAR KALAMAZOO, MI

LOCATION.--Lat 42°14'46", long 85°34'33", in SE¼ sec.34, T.2 S., R.11 W., Kalamazoo County, Hydrologic Unit 04050003, on left bank 25 ft (8 m) upstream from bridge on Lovers Lane, and 3.0 mi (4.8 km) south of Kalamazoo.

DRAINAGE AREA.--22.4 mi<sup>2</sup> (58.0 km<sup>2</sup>).

PERIOD OF RECORD.--October 1964 to current year.

GAGE.--Water-stage recorder. Datum of gage is 814.88 ft (248.375 m) National Geodetic Vertical Datum of 1929.

REMARKS.--Records good. Flow includes water which is pumped from ground-water sources by industry and discharged into stream 2.0 mi (3.2 km) upstream from station. Several observations of water temperature were made during the year.

AVERAGE DISCHARGE.--14 years, 39.9 ft<sup>3</sup>/s (1.130 m<sup>3</sup>/s), 24.19 in/yr (614 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 290 ft<sup>3</sup>/s (8.21 m<sup>3</sup>/s) June 26, 1978, gage height, 4.49 ft (1.369 m); minimum 8.0 ft<sup>3</sup>/s (0.23 m<sup>3</sup>/s) Jan. 19, 1965, gage height, 0.88 ft (0.268 m), result of bridge construction upstream.

EXTREMES FOR CURRENT YEAR.--Peak discharges above base of 85 ft<sup>3</sup>/s (2.41 m<sup>3</sup>/s) and maximum (\*):

Date	Time	Discharge (ft <sup>3</sup> /s) (m <sup>3</sup> /s)	Gage height (ft) (m)	Date	Time	Discharge (ft <sup>3</sup> /s) (m <sup>3</sup> /s)	Gage height (ft) (m)
Mar. 21	0300	88 2.49	2.68 0.817	July 21	0600	99 2.80	2.90 0.884
Apr. 6	1600	92 2.61	2.74 0.835	Sept. 12	0900	133 3.77	3.36 1.024
May 20	1700	117 3.31	3.05 0.930	Sept. 13	1300	145 4.11	3.48 1.061
June 26	1100	*290 8.21	*4.49 1.369	Sept. 17	1300	167 4.73	3.68 1.122

Minimum discharge, 22 ft<sup>3</sup>/s (0.62 m<sup>3</sup>/s) Jan. 26, gage height, 1.46 ft (0.445 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	47	32	46	30	28	28	49	32	34	53	32	36
2	33	30	36	30	30	28	41	31	34	57	32	34
3	33	30	34	30	31	28	42	32	35	45	32	34
4	33	31	30	30	29	27	45	32	32	40	32	33
5	33	30	31	31	28	26	40	32	34	41	29	33
6	32	30	30	31	29	27	69	32	35	40	29	32
7	32	30	30	30	29	26	51	31	37	41	31	33
8	35	31	30	30	29	27	39	33	42	38	31	33
9	31	31	31	30	30	28	36	33	37	36	32	33
10	32	32	31	29	28	28	38	33	35	38	31	31
11	32	32	29	29	26	27	41	40	34	36	31	31
12	30	30	31	29	25	28	37	38	39	35	30	87
13	31	29	35	29	27	30	36	65	35	38	28	92
14	31	30	36	27	27	38	34	49	34	40	30	63
15	30	31	34	26	27	35	32	42	34	37	30	47
16	29	31	35	29	28	34	31	38	37	37	38	42
17	30	32	37	30	30	33	33	37	36	36	35	113
18	31	32	46	30	27	30	34	36	34	34	35	90
19	31	30	39	30	27	30	34	36	34	34	43	62
20	31	33	42	30	27	35	35	59	36	35	36	49
21	30	32	37	29	27	60	35	56	39	72	35	49
22	29	29	35	27	28	46	33	47	33	46	34	42
23	28	30	34	30	27	46	32	43	33	43	33	40
24	30	28	33	30	28	43	37	42	33	38	34	37
25	30	30	32	31	27	38	38	39	41	35	35	37
26	32	28	33	27	26	38	33	37	195	36	37	37
27	30	28	32	31	28	36	32	34	104	36	43	36
28	30	30	32	30	29	42	32	32	66	35	46	36
29	29	29	32	27	---	44	31	33	52	32	40	35
30	28	32	32	28	---	43	32	35	43	31	37	36
31	30	---	30	28	---	45	---	35	---	33	36	---
TOTAL	973	913	1055	908	782	1074	1132	1194	1347	1228	1057	1393
MEAN	31.4	30.4	34.0	29.3	27.9	34.6	37.7	38.5	44.9	39.6	34.1	46.4
MAX	47	33	46	31	31	60	69	65	195	72	46	113
MIN	28	28	29	26	25	26	31	31	32	31	28	31

CAL YR 1977 TOTAL 11958 MEAN 32.8 MAX 83 MIN 21  
WTR YR 1978 TOTAL 13056 MEAN 35.8 MAX 195 MIN 25

STREAMS TRIBUTARY TO LAKE MICHIGAN

173

04106320 WEST FORK PORTAGE CREEK NEAR OSHTEMO, MI

LOCATION.--Lat 42°14'07", long 85°38'54", in SE¼ sec.1, T.3 S., R.12 W., Kalamazoo County, Hydrologic Unit 04050003, on right bank at upstream side of culvert on 12th Street, 2.1 mi (3.4 km) southeast of Oshtemo.

DRAINAGE AREA.--13.0 mi<sup>2</sup> (33.7 km<sup>2</sup>).

PERIOD OF RECORD.--May 1972 to current year.

GAGE.--Water-stage recorder. Datum of gage is 868.86 ft (264.829 m) Kalamazoo County Road Commission datum.

REMARKS.--Records good. Several observations of water temperature were made during the year.

AVERAGE DISCHARGE.--6 years, 8.41 ft<sup>3</sup>/s (0.238 m<sup>3</sup>/s), 8.79 in/yr (223 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 26 ft<sup>3</sup>/s (0.74 m<sup>3</sup>/s) Aug. 31, 1975, gage height, 2.15 ft (0.655 m); minimum, 2.0 ft<sup>3</sup>/s (0.057 m<sup>3</sup>/s) Aug. 2, 3, 4, 1977; minimum gage height, 1.08 ft (0.329 m) July 23, 24, 27, 28, 29, Aug. 2, 3, 4, 1977.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 19 ft<sup>3</sup>/s (0.54 m<sup>3</sup>/s) June 27, gage height, 1.94 ft (0.591 m); minimum, 3.2 ft<sup>3</sup>/s (0.091 m<sup>3</sup>/s) June 9, 10, gage height, 1.15 ft (0.351 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	6.2	4.5	6.0	6.5	6.7	6.8	10	6.9	5.3	10	5.7	5.9
2	6.7	4.5	6.0	6.5	6.7	6.8	9.8	6.9	5.2	10	5.7	5.9
3	6.4	4.4	5.7	6.5	6.7	6.8	9.8	6.9	4.5	10	5.5	5.7
4	5.7	4.2	5.2	6.5	6.7	6.8	9.8	6.5	4.4	9.8	5.2	5.5
5	5.3	4.2	4.8	6.5	6.7	6.8	9.6	6.7	4.2	8.7	5.2	5.7
6	5.0	4.2	4.8	6.5	6.7	6.8	11	7.2	4.2	8.1	5.2	5.7
7	4.7	4.2	4.7	6.5	6.7	6.8	11	7.1	4.2	7.4	5.3	5.5
8	5.2	4.2	4.5	6.5	6.8	6.8	10	7.2	4.7	7.2	5.3	5.5
9	5.3	4.2	4.5	6.5	6.8	6.8	9.5	7.4	4.2	7.1	5.3	5.3
10	5.2	4.5	4.5	6.5	6.8	6.8	9.5	7.2	4.0	6.9	5.0	5.3
11	5.2	4.7	4.5	6.5	6.8	6.8	9.5	7.4	4.4	6.7	5.0	5.2
12	5.0	4.7	4.6	6.5	6.8	6.8	9.1	8.7	4.4	6.4	4.8	7.6
13	4.8	4.5	4.6	6.5	6.8	6.8	8.1	9.6	4.2	6.7	4.7	11
14	4.7	4.5	4.7	6.5	6.8	7.1	7.8	11	4.4	6.2	4.7	14
15	4.7	4.8	5.0	6.5	6.8	8.0	7.6	11	4.5	6.0	4.7	13
16	4.7	4.8	5.0	6.5	6.8	8.0	7.4	9.8	4.5	5.9	4.8	11
17	4.5	5.0	5.2	6.5	6.8	7.8	7.4	9.1	4.8	6.2	4.7	13
18	4.5	5.0	6.0	6.5	6.8	7.8	7.2	8.3	5.2	6.6	4.5	17
19	4.7	4.7	6.2	6.5	6.8	7.4	7.6	7.8	5.2	5.5	4.7	16
20	4.7	5.2	6.9	6.5	6.8	7.6	7.6	7.6	5.0	5.3	4.7	13
21	4.7	5.5	6.7	6.5	6.8	9.6	7.6	7.6	5.7	7.6	4.7	12
22	4.5	5.3	6.9	6.5	6.8	10	7.4	7.4	5.3	7.6	4.8	10
23	4.5	5.2	6.7	6.5	6.8	10	7.4	7.1	5.3	8.0	4.8	9.5
24	4.5	5.2	6.5	6.5	6.8	9.5	7.6	7.1	5.3	7.4	5.0	9.9
25	4.5	5.2	6.4	6.5	6.8	9.1	7.6	6.7	5.9	6.7	5.0	9.3
26	4.5	5.0	6.4	6.7	6.8	9.1	7.6	6.5	14	6.4	5.0	8.1
27	4.5	4.8	6.4	6.7	6.8	8.9	7.4	6.4	19	6.0	5.3	8.0
28	4.5	4.8	6.4	6.7	6.8	8.9	7.2	6.2	17	5.9	6.4	7.6
29	4.5	4.7	6.4	6.7	---	9.1	7.2	5.9	13	5.9	6.5	7.4
30	4.4	4.8	6.2	6.7	---	9.3	7.1	5.7	11	5.9	6.4	7.2
31	4.4	---	6.4	6.7	---	9.3	---	5.5	---	5.9	6.0	---
TOTAL	152.7	141.5	174.8	202.7	189.7	244.9	253.4	232.4	193.0	220.0	160.6	263.8
MFAN	4.93	4.72	5.64	6.54	6.78	7.90	8.45	7.50	6.43	7.10	5.18	8.79
MAX	6.7	5.5	6.9	6.7	6.8	10	11	11	19	10	6.5	17
MIN	4.4	4.2	4.5	6.5	6.7	6.8	7.1	5.5	4.0	5.3	4.5	5.2
CFSM	.38	.36	.43	.50	.52	.61	.65	.58	.50	.55	.40	.58
IN.	.44	.40	.50	.58	.54	.70	.73	.66	.55	.63	.46	.75

CAL YR 1977 TOTAL 2121.3 MEAN 5.81 MAX 12 MIN 2.1 CFSM .45 IN 6.07  
WTR YR 1978 TOTAL 2429.5 MEAN 6.66 MAX 19 MIN 4.0 CFSM .51 IN 6.95

## STREAMS TRIBUTARY TO LAKE MICHIGAN

04106400 WEST FORK PORTAGE CREEK AT KALAMAZOO, MI

LOCATION.--Lat 42°14'40", long 85°36'50", in NE¼ sec.5, T.3 S., R.11 W., Kalamazoo County, Hydrologic Unit 04050003, on right bank 30 ft (9 m) upstream from culvert on Oakland Drive, 2.5 mi (4.0 km) upstream from mouth, and 3.7 mi (6.0 km) southwest of main business district of Kalamazoo.

DRAINAGE AREA.--18.7 mi<sup>2</sup> (48.4 km<sup>2</sup>).

PERIOD OF RECORD.--September 1959 to current year.

GAGE.--Water-stage recorder and V-notch sharp-crested weir. Datum of gage is 858.09 ft (261.546 m) National Geodetic Vertical Datum of 1929 (Levels by Michigan Department of Natural Resources).

REMARKS.--Records good except those for the winter period, which are fair. At times flow is affected by ground-water withdrawals. Several observations of water temperature were made during the year.

AVERAGE DISCHARGE.--19 years, 9.97 ft<sup>3</sup>/s (0.282 m<sup>3</sup>/s), 7.24 in/yr (184 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 41 ft<sup>3</sup>/s (1.16 m<sup>3</sup>/s) Apr. 19, 1975, gage height, 3.32 ft (1.012 m); minimum, 1.0 ft<sup>3</sup>/s (0.028 m<sup>3</sup>/s) Aug. 9, 1964; minimum gage height, 0.88 ft (0.268 m) July 30, 1963, caused by construction.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 28 ft<sup>3</sup>/s (0.79 m<sup>3</sup>/s) June 26, gage height, 3.07 ft (0.936 m); maximum gage height, 3.18 ft (0.969 m) Feb. 12, backwater from ice; minimum discharge, 2.9 ft<sup>3</sup>/s (0.082 m<sup>3</sup>/s) June 7, gage height, 2.25 ft (0.686 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	9.0	5.3	7.9	7.3	7.1	7.0	14	8.7	6.6	13	5.8	7.1
2	9.8	5.6	9.0	7.3	7.1	7.0	12	8.7	5.8	14	5.6	6.8
3	9.2	5.6	8.7	7.3	7.1	7.0	12	7.6	5.3	13	5.8	6.8
4	8.7	5.6	7.8	7.3	7.1	7.0	13	7.9	4.6	11	5.6	6.6
5	7.9	5.6	7.2	7.3	7.1	7.0	12	8.4	4.1	10	5.3	6.3
6	7.1	5.6	6.8	7.3	7.1	7.0	15	7.1	3.9	9.5	5.1	6.1
7	6.6	5.6	6.4	7.3	7.1	7.0	16	9.0	3.0	9.0	4.8	5.6
8	7.4	5.6	7.3	7.3	7.1	7.0	14	9.2	3.4	8.4	5.1	5.3
9	7.6	5.6	7.2	7.2	7.1	7.0	13	8.7	4.1	7.4	5.1	5.1
10	7.4	6.3	7.2	7.2	7.1	7.0	12	9.8	3.6	6.6	5.3	4.6
11	7.1	6.3	7.3	7.2	7.1	7.0	12	7.9	5.1	5.8	5.1	4.6
12	7.1	6.3	7.6	7.2	7.1	7.5	12	9.5	5.1	5.6	5.3	9.8
13	6.8	6.3	8.0	7.2	7.1	8.2	10	13	4.6	5.8	5.1	15
14	6.6	6.3	7.6	7.2	7.1	9.2	9.5	14	4.4	6.1	4.8	17
15	6.3	6.6	7.9	7.2	7.1	10	11	14	4.4	6.1	4.6	16
16	6.1	6.8	7.9	7.2	7.1	10	10	13	4.4	5.8	5.1	15
17	5.6	6.8	8.1	7.2	7.1	11	10	12	4.8	5.3	5.3	22
18	5.6	7.1	9.8	7.2	7.1	10	9.5	10	3.9	5.1	4.6	25
19	6.1	6.8	11	7.2	7.1	9.8	9.5	11	3.6	5.1	3.6	22
20	6.1	7.4	11	7.2	7.1	10	9.8	9.8	3.9	5.3	3.9	19
21	5.8	7.9	11	7.2	7.1	14	8.1	10	4.8	8.4	6.1	17
22	5.8	7.4	10	7.2	7.1	14	8.1	9.5	5.3	8.4	5.6	15
23	5.6	7.1	9.8	7.2	7.1	14	9.5	8.7	5.1	8.4	5.1	13
24	5.6	7.1	9.2	7.2	7.1	12	7.9	8.7	4.8	8.4	5.3	12
25	5.6	6.8	9.0	7.2	7.1	11	9.5	8.7	5.6	7.6	5.3	11
26	5.6	6.8	8.8	7.2	7.1	11	7.6	8.7	19	7.4	5.3	10
27	5.6	6.6	8.4	7.2	7.1	11	9.0	8.4	25	7.1	5.6	9.8
28	5.3	6.8	8.0	7.2	7.1	11	8.4	8.1	22	6.8	7.6	9.8
29	5.3	6.3	7.8	7.2	---	11	8.7	6.1	19	6.6	7.6	9.8
30	5.3	6.1	7.6	7.2	---	11	8.7	6.8	15	6.1	7.4	9.8
31	5.3	---	7.4	7.1	---	10	---	6.8	---	5.8	7.4	---
TOTAL	204.9	192.0	258.7	223.9	198.8	292.7	321.8	289.8	214.2	238.9	169.2	342.9
MEAN	6.61	6.40	8.35	7.22	7.10	9.44	10.7	9.35	7.14	7.71	5.46	11.4
MAX	9.8	7.9	11	7.3	7.1	14	16	14	25	14	7.6	25
MIN	5.3	5.3	6.4	7.1	7.1	7.0	7.6	6.1	3.0	5.1	3.6	4.6
CFSM	.35	.34	.45	.39	.38	.51	.57	.50	.38	.41	.29	.61
IN.	.41	.38	.51	.45	.40	.58	.64	.58	.43	.48	.34	.68

CAL YR 1977 TOTAL 3063.9 MEAN 8.39 MAX 19 MIN 2.8 CFSM .45 IN 6.09  
WTR YR 1978 TOTAL 2947.8 MEAN 8.08 MAX 25 MIN 3.0 CFSM .43 IN 5.86

## STREAMS TRIBUTARY TO LAKE MICHIGAN

175

04106500 PORTAGE CREEK AT KALAMAZOO, MI

LOCATION.--Lat 42°16'27", long 85°34'35", in NW¼ NE¼ sec.27, T.2 S., R.11 W., Kalamazoo County, Hydrologic Unit 04050003, on left bank 50 ft (15 m) upstream from bridge on Reed Avenue in Kalamazoo, and 1.5 miles (2.4 km) upstream from mouth.

DRAINAGE AREA.--46.8 mi<sup>2</sup> (121.2 km<sup>2</sup>).

## WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--October 1947 to September 1958, June 1975 to current year. Monthly discharge only for some periods, published in WSP 1307.

GAGE.--Water-stage recorder. Datum of gage is 761.50 ft (232.105 m) National Geodetic Vertical Datum of 1929 (levels by Michigan Department of Natural Resources). Dec. 15, 1947, to Dec. 7, 1955, nonrecording gage at same site and datum.

REMARKS.--Water-discharge records fair. Some regulation by millponds upstream from station. Flow includes water which is pumped from ground-water sources by industry and discharged into stream 5.0 mi (8.0 km) upstream from station.

AVERAGE DISCHARGE.--14 years (1947-58, 1976-78), 54.8 ft<sup>3</sup>/s (1.552 m<sup>3</sup>/s), 15.90 in/yr (404 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 580 ft<sup>3</sup>/s (16.4 m<sup>3</sup>/s) sometime in July 1954 from rating curve extended above 165 ft<sup>3</sup>/s (4.67 m<sup>3</sup>/s), gage height, 5.25 ft (1.600 m) caused by momentary gate opening of millpond; maximum gage height, 5.44 ft (1.658 m) June 26, 1978; minimum discharge, 2.0 ft<sup>3</sup>/s (0.057 m<sup>3</sup>/s) May 8, 1956, gage height, 1.50 ft (0.457 m).

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 567 ft<sup>3</sup>/s (16.1 m<sup>3</sup>/s) June 26, gage height, 5.44 ft (1.658 m); minimum, 4.4 ft<sup>3</sup>/s (0.12 m<sup>3</sup>/s) Sept. 22, gage height, 1.62 ft (0.494 m); minimum daily, 25 ft<sup>3</sup>/s (0.71 m<sup>3</sup>/s) Feb. 12.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	71	36	57	41	33	28	70	42	39	65	33	32
2	46	33	42	40	34	29	61	39	37	75	32	31
3	41	34	42	38	37	28	62	39	41	59	32	32
4	40	34	40	39	36	27	68	40	37	51	31	33
5	40	36	37	41	31	26	58	42	37	47	30	30
6	38	36	35	39	28	26	113	38	39	46	29	29
7	38	34	34	42	28	26	81	37	46	45	30	30
8	50	34	35	43	28	26	56	42	44	43	30	29
9	42	34	33	38	28	27	52	43	39	40	32	30
10	39	36	36	37	26	30	52	41	38	41	31	30
11	39	36	36	37	26	29	55	57	39	38	29	29
12	37	33	35	36	25	33	47	60	46	37	29	132
13	37	35	41	37	26	33	45	114	38	39	28	135
14	37	33	46	35	27	50	41	75	36	41	29	76
15	38	36	42	34	27	44	39	57	36	40	29	51
16	36	33	43	34	28	42	37	50	38	42	39	46
17	36	36	46	37	30	41	38	48	38	38	29	205
18	40	35	81	36	28	39	41	45	41	36	29	157
19	37	33	57	37	27	39	42	43	38	35	41	84
20	36	43	68	37	26	47	43	65	43	38	32	63
21	36	38	46	36	26	105	42	66	52	81	31	60
22	36	33	45	35	28	60	38	47	39	47	30	47
23	36	34	43	37	27	62	40	44	38	49	28	49
24	33	32	45	37	27	61	41	44	40	41	30	43
25	34	35	47	37	27	53	46	46	61	38	31	41
26	36	34	45	35	27	57	40	41	387	37	33	41
27	34	32	41	36	27	49	35	39	151	38	45	38
28	34	31	40	37	29	53	36	41	78	37	47	40
29	33	31	41	32	---	70	36	41	63	34	37	40
30	36	33	40	29	---	61	37	39	54	34	34	41
31	34	---	38	31	---	60	---	40	---	35	33	---
TOTAL	1200	1033	1357	1140	797	1361	1492	1505	1753	1367	1003	1724
MEAN	38.7	34.4	43.8	36.8	28.5	43.9	49.7	48.5	58.4	44.1	32.4	57.5
MAX	71	43	81	43	37	105	113	114	387	81	47	205
MIN	33	31	33	29	25	26	35	37	36	34	28	29

CAL YR 1977 TOTAL 15422 MEAN 42.3 MAX 125 MIN 20  
WTR YR 1978 TOTAL 15732 MEAN 43.1 MAX 387 MIN 25



STREAMS TRIBUTARY TO LAKE MICHIGAN  
04106500 PORTAGE CREEK AT KALAMAZOO, MI--CONTINUED  
WATER-QUALITY RECORDS

PERIOD OF DAILY RECORD.--

WATER TEMPERATURES: April 1972 to August 1974, August 1975 to current year.

INSTRUMENTATION.--Temperature recorder April 1972 to August 1974, August 1975 to current year.

REMARKS.--Interruptions in the record were due to malfunctions of the instrument.

EXTREMES FOR PERIOD OF DAILY RECORD.--

WATER TEMPERATURES: Maximum, 29.5°C July 21, 1972, minimum, 0.0°C Dec. 31, 1976, Jan. 1, 2, 1977.

EXTREMES FOR CURRENT YEAR.--

WATER TEMPERATURES: Maximum, 25.0°C July 6, 7, 20, 22; minimum recorded, 1.0°C Dec. 11, 25-28, 31, Jan. 1, 10, 11.

TEMPERATURE (DEG. C) OF WATER, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
OCTOBER			NOVEMBER			DECEMBER			JANUARY			
1	16.0	13.0	14.0	---	---	---	6.0	5.0	5.5	1.0	1.0	1.0
2	13.5	12.0	13.0	---	---	---	7.0	4.5	5.5	---	---	---
3	14.0	10.5	13.0	---	---	---	6.0	4.5	5.5	---	---	---
4	14.0	13.0	13.5	---	---	---	5.5	3.5	4.5	---	---	---
5	---	---	---	15.5	14.5	15.0	5.5	3.5	4.0	---	---	---
6	---	---	---	15.0	14.5	14.5	5.0	3.5	4.5	---	---	---
7	---	---	---	17.0	15.0	16.0	4.5	3.0	3.5	---	---	---
8	---	---	---	17.0	16.5	16.5	3.5	2.5	3.0	---	---	---
9	---	---	---	17.0	16.5	16.5	3.0	2.0	2.5	---	---	---
10	---	---	---	16.0	9.5	13.0	2.5	1.5	1.5	3.0	1.0	1.5
11	---	---	---	11.0	8.0	9.5	2.0	1.0	1.5	3.5	1.0	2.0
12	---	---	---	10.0	6.5	8.0	5.0	1.5	2.5	3.0	1.5	2.5
13	---	---	---	8.5	5.0	6.5	7.5	5.0	6.0	4.5	1.5	3.5
14	---	---	---	10.0	6.5	8.0	8.0	5.0	7.0	4.0	2.0	3.5
15	---	---	---	12.0	9.0	10.5	9.0	8.0	8.5	3.0	1.5	2.0
16	---	---	---	13.0	11.0	12.0	9.5	6.5	8.5	3.5	2.0	2.5
17	---	---	---	12.5	9.0	11.0	10.0	8.5	9.5	4.0	3.0	3.5
18	---	---	---	10.0	8.0	9.0	8.5	7.0	8.0	4.5	3.0	3.5
19	---	---	---	9.0	6.5	7.5	8.5	6.5	7.5	5.5	4.0	5.0
20	---	---	---	10.5	7.0	9.0	8.5	6.5	8.0	5.0	3.0	4.0
21	---	---	---	10.0	9.0	9.5	6.0	2.5	3.5	5.5	3.0	4.5
22	---	---	---	9.0	7.5	8.5	5.0	1.5	3.0	4.5	3.0	3.5
23	---	---	---	8.5	6.5	8.5	5.5	1.5	3.5	4.5	3.0	3.5
24	---	---	---	8.5	7.0	8.0	4.5	2.5	3.5	5.0	4.5	5.0
25	---	---	---	7.5	4.0	6.5	3.0	1.0	1.5	6.5	4.5	5.5
26	---	---	---	5.5	3.0	4.5	1.0	1.0	1.0	4.0	1.5	2.5
27	---	---	---	4.5	2.0	4.0	2.0	1.0	1.5	3.0	1.5	2.0
28	---	---	---	5.5	4.0	4.5	3.0	1.0	2.0	3.0	1.5	2.5
29	---	---	---	6.5	5.0	5.5	5.0	1.5	2.5	2.5	1.5	2.0
30	---	---	---	6.5	5.5	6.0	5.0	1.5	3.0	3.5	2.0	2.5
31	---	---	---	---	---	---	3.5	1.0	1.5	5.5	3.5	4.5
MONTH							10.0	1.0	4.5			

STREAMS TRIBUTARY TO LAKE MICHIGAN  
04106500 PORTAGE CREEK AT KALAMAZOO, MI--CONTINUED

177

TEMPERATURE (DEG. C) OF WATER, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
FEBRUARY			MARCH			APRIL			MAY			
1	5.5	4.0	4.5	6.0	5.0	5.5	13.5	10.0	11.5	13.5	9.5	12.0
2	5.0	2.0	4.0	---	---	---	9.5	5.5	7.0	14.0	10.0	12.5
3	3.5	1.5	2.5	---	---	---	12.0	5.0	8.5	14.5	11.0	13.5
4	3.5	1.5	2.0	---	---	---	12.5	9.5	11.5	14.0	10.5	12.0
5	5.0	2.5	3.5	---	---	---	12.0	8.0	10.0	10.5	10.0	10.0
6	5.0	3.0	4.0	---	---	---	12.0	8.5	9.0	15.5	10.0	13.0
7	6.5	4.0	5.0	---	---	---	13.5	8.0	10.5	15.5	14.0	14.5
8	6.0	4.0	5.0	---	---	---	12.5	10.0	11.0	15.5	13.5	14.0
9	6.0	3.5	5.0	---	---	---	10.0	7.5	8.5	15.5	14.0	14.5
10	5.5	4.0	4.5	---	---	---	13.5	7.5	10.0	18.5	13.5	15.5
11	5.0	3.5	4.0	---	---	---	12.0	10.5	11.0	17.5	14.5	16.0
12	---	---	---	---	---	---	13.5	9.0	11.5	18.5	14.0	16.0
13	---	---	---	---	---	---	12.5	9.5	10.5	18.5	16.0	17.0
14	6.0	5.0	5.0	---	---	---	12.5	8.5	10.5	17.0	15.0	15.5
15	6.5	5.0	5.5	---	---	---	12.5	9.5	11.5	14.5	14.0	14.0
16	7.5	5.5	6.0	---	---	---	13.5	10.0	11.5	16.5	13.5	15.0
17	6.0	4.5	5.5	---	---	---	14.0	10.0	12.5	19.0	15.0	16.5
18	6.5	3.5	4.5	---	---	---	13.5	10.0	11.0	21.0	17.0	19.0
19	4.5	2.5	3.5	---	---	---	11.5	10.0	11.0	22.5	18.5	20.5
20	5.0	2.5	3.5	---	---	---	11.0	9.5	10.5	22.0	18.5	20.5
21	6.0	3.5	4.5	---	---	---	13.0	9.0	10.5	18.5	15.5	16.5
22	7.0	4.0	5.0	---	---	---	14.5	10.5	12.5	19.5	14.5	17.0
23	5.5	4.5	5.0	---	---	---	14.0	9.0	11.0	18.5	17.0	18.0
24	6.5	5.5	5.5	---	---	---	15.0	9.0	11.5	21.5	16.5	19.0
25	7.0	4.0	5.5	---	---	---	16.0	12.5	14.5	23.0	18.5	21.0
26	5.5	3.5	4.5	---	---	---	16.5	11.5	14.0	24.5	19.5	22.5
27	5.5	4.0	4.5	---	---	---	16.5	13.0	15.0	24.0	20.5	22.5
28	7.0	5.0	5.5	---	---	---	17.5	13.5	15.5	24.0	20.0	22.0
29	---	---	---	---	---	---	17.0	14.5	16.0	24.0	20.0	22.0
30	---	---	---	---	---	---	16.0	13.5	14.5	23.5	21.0	22.0
31	---	---	---	---	---	---	---	---	---	24.0	19.5	22.0
MONTH							17.5	5.0	11.5	24.5	9.5	17.0
DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
JUNE			JULY			AUGUST			SEPTEMBER			
1	24.5	21.0	23.0	23.0	18.5	20.5	22.5	19.0	20.5	21.5	18.0	20.0
2	23.0	20.0	21.5	18.5	16.5	17.0	21.0	18.5	20.0	21.0	18.0	20.0
3	21.0	17.5	19.5	20.0	16.0	18.0	21.5	18.5	20.0	21.5	18.5	20.0
4	22.0	17.5	20.0	22.0	16.5	19.5	19.5	16.5	18.0	20.5	17.0	19.0
5	22.5	18.0	20.5	23.5	18.0	21.5	20.0	16.0	18.5	22.0	17.0	20.0
6	22.5	19.0	21.0	25.0	20.5	23.0	21.0	17.5	19.0	22.5	18.5	21.0
7	22.5	19.5	21.0	25.0	21.5	23.0	20.0	18.0	19.0	23.0	19.5	21.5
8	21.0	17.0	18.0	23.5	21.0	22.0	22.0	17.0	19.5	23.5	20.5	22.0
9	21.5	15.0	18.0	22.5	19.0	21.0	22.0	19.5	21.0	24.0	21.0	22.5
10	22.0	18.0	20.0	22.0	19.0	21.0	21.5	18.0	20.0	23.5	20.5	22.0
11	22.5	17.5	20.5	21.5	17.0	19.5	20.0	18.5	19.0	23.5	20.5	22.0
12	21.5	19.0	20.0	21.5	18.0	20.0	20.5	17.0	19.0	23.0	18.5	19.5
13	19.0	15.0	17.5	21.0	18.5	19.5	21.5	17.0	19.5	18.5	16.0	17.0
14	17.5	15.5	17.0	22.0	17.0	19.5	23.5	18.0	21.0	23.0	16.5	18.5
15	19.5	16.0	18.0	22.5	19.0	21.0	22.5	19.0	21.5	23.0	18.0	20.0
16	19.0	17.5	18.0	21.5	17.0	19.5	22.0	18.5	20.5	21.0	18.5	19.5
17	22.5	18.5	20.5	22.0	17.0	20.0	21.5	18.0	19.5	20.5	18.5	19.0
18	22.5	20.0	21.5	23.5	20.0	21.5	21.5	18.0	20.0	20.5	18.0	19.0
19	24.0	19.5	22.0	23.5	21.0	22.0	21.0	18.5	20.0	23.0	20.0	21.0
20	24.0	20.0	22.5	25.0	20.0	22.5	20.0	15.5	18.0	24.0	22.0	23.0
21	23.0	20.0	22.0	23.5	20.5	22.0	20.5	16.0	18.5	23.5	18.5	21.0
22	21.5	18.0	20.0	25.0	20.5	23.0	22.0	17.5	19.5	19.0	17.0	18.0
23	22.0	18.0	20.5	24.0	20.5	21.5	23.0	18.0	21.0	19.0	16.0	17.5
24	23.0	19.0	21.0	21.5	18.0	20.0	23.0	19.0	21.5	19.5	15.5	18.0
25	22.5	18.5	20.5	23.0	19.5	21.0	23.0	20.5	21.0	18.0	17.0	18.0
26	20.0	18.0	19.0	24.0	20.5	22.0	21.0	19.0	20.0	19.0	16.5	17.5
27	23.0	18.5	20.5	23.0	20.0	21.5	21.0	19.5	20.0	18.0	16.0	17.0
28	23.0	19.5	21.5	21.5	18.0	20.0	21.0	19.0	20.0	18.0	14.5	16.5
29	24.0	21.5	22.5	21.0	18.5	20.0	21.5	19.0	20.5	17.5	15.5	16.5
30	23.5	21.5	22.5	19.0	16.0	18.0	21.0	18.0	19.5	17.0	16.0	16.5
31	---	---	---	21.5	16.5	19.5	21.0	18.0	19.5	---	---	---
NTH	24.5	15.0	20.5	25.0	16.0	20.5	23.5	15.5	20.0	24.0	14.5	19.5

## STREAMS TRIBUTARY TO LAKE MICHIGAN

04108500 KALAMAZOO RIVER NEAR FENNIVILLE, MI

LOCATION.--Lat 42°35'36", long 85°59'03", in NE¼ sec.5, T.2 N., R.14 W., Allegan County, Hydrologic Unit 04050003, on left bank 40 ft (12 m) upstream from bridge on State Highway 89, 2.1 mi (3.4 km) downstream from Swan Creek, 4.0 mi (6.4 km) downstream from Calkins Dam, and 6.1 mi (9.8 km) east of Fennville.

DRAINAGE AREA.--1,600 mi<sup>2</sup> (4,144 km<sup>2</sup>), approximately.

PERIOD OF RECORD.--April 1929 to September 1936, October 1937 to current year. Monthly discharge only for some periods, published in WSP 1307. Published as "near Allegan" April 1929 to September 1932; as "at Calkins Bridge, near Allegan" October 1932 to September 1936, October 1937 to September 1938; as "at Calkins Dam, near Allegan" October 1938 to September 1950.

REVISED RECORDS.--WSP 1387: 1929(M), 1930, 1933, 1934-36(M), 1938(M), 1939-40, 1942.

GAGE.--Water-stage recorder. Datum of gage is 586.51 ft (178.768 m) National Geodetic Vertical Datum of 1929 (levels by Michigan Department of Natural Resources). April 1929 to September 1936 at bridge and October 1937 to September 1950 in powerplant, 4.0 mi (6.4 km) upstream at NGVD (levels by city of Allegan).

REMARKS.--Records good except those for the winter period, which are fair. Flow regulated at low and medium stages by powerplants upstream from station and since June 1936, by Calkins Dam and powerplant, 4.0 mi (6.4 km) upstream from station. Several observations of water temperature were made during the year.

AVERAGE DISCHARGE.--48 years, 1,385 ft<sup>3</sup>/s (39.22 m<sup>3</sup>/s), 11.76 in/yr (299 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 17,500 ft<sup>3</sup>/s (496 m<sup>3</sup>/s) Apr. 11, 1947, gage height, 606.76 ft (184.940 m), site and datum then in use; minimum daily, 50 ft<sup>3</sup>/s (1.42 m<sup>3</sup>/s) Aug. 19, 1976, caused by shutting off flow at Calkins Dam.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 9,030 ft<sup>3</sup>/s (256 m<sup>3</sup>/s) June 27, gage height, 14.30 ft (4.359 m); minimum, 240 ft<sup>3</sup>/s (6.80 m<sup>3</sup>/s) Oct. 9, gage height, 4.10 ft (1.250 m); minimum daily, 333 ft<sup>3</sup>/s (9.43 m<sup>3</sup>/s) Oct. 8.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1200	772	862	1680	1090	1110	2920	1620	1090	4940	798	872
2	1200	1040	1320	1680	1250	1110	3250	1390	1090	4010	786	846
3	1670	1010	1830	1560	1350	1110	3060	1120	1080	3850	791	801
4	1970	988	1660	1580	1050	1060	2640	1210	1050	3330	996	811
5	1980	712	1300	1580	800	833	2910	772	965	2600	1190	855
6	1360	738	1240	1420	1100	1120	3160	1300	941	2690	1200	827
7	726	902	1230	756	1400	1210	3780	1700	940	2380	1020	793
8	333	885	1600	1170	1100	1100	4010	1510	946	2110	807	737
9	452	883	1490	1660	1050	1240	3060	861	951	1880	1160	583
10	715	866	866	1510	1100	1090	2840	1060	1010	1740	1280	580
11	793	927	822	846	1000	833	2920	1300	1080	1210	957	750
12	1010	973	1190	1170	950	1110	2910	1740	1080	1460	957	868
13	1050	931	1540	1480	1100	1190	2810	1310	1010	1770	929	1650
14	1030	720	1360	1450	1200	1340	2540	2340	936	1640	921	2100
15	1050	776	1060	1350	1100	1720	2320	2900	933	1140	886	1870
16	1080	1070	1670	767	1150	1780	2300	1820	936	1120	829	1810
17	995	1060	1690	1290	1100	1760	2290	2250	938	1110	794	1770
18	831	1060	1890	1480	950	1880	2140	2170	942	1090	699	2150
19	936	1090	1900	1020	1200	1810	1860	1940	937	1060	643	2990
20	1010	1100	1920	776	1220	1830	1820	2140	921	1400	982	2860
21	1020	1070	2080	1170	1240	2100	1890	2180	919	1720	997	2350
22	1070	1110	2100	1320	1200	2490	1820	2050	916	1420	967	1770
23	894	1250	2240	789	1190	3170	1810	1790	957	1400	918	1760
24	747	1200	2220	770	1200	3220	1810	1700	986	1450	901	2080
25	957	1090	2040	1210	1180	3400	1740	1690	937	1050	902	1440
26	945	1120	1800	1620	1200	2820	1410	1410	2990	1280	899	1090
27	953	1110	1530	1200	1180	2750	1160	1120	8330	1510	895	1080
28	743	1090	1150	1100	1140	3180	1390	1430	7880	1580	852	1110
29	994	1050	1440	1100	---	3660	1600	1670	6820	1490	861	1470
30	918	1050	1530	1100	---	3860	1600	1110	5280	828	870	1480
31	757	---	1390	1000	---	3490	---	1090	---	802	871	---
TOTAL	31389	29643	47960	38404	31790	60376	71770	49693	55791	57060	28558	42353
MEAN	1013	988	1547	1239	1135	1948	2392	1603	1860	1841	921	1412
MAX	1980	1250	2240	1680	1400	3860	4010	2900	8330	4940	1280	2990
MTN	333	712	822	756	800	833	1160	772	916	802	643	580
CFSM	.63	.62	.97	.77	.71	1.22	1.50	1.00	1.16	1.15	.58	.88
IN.	.73	.69	1.12	.89	.74	1.40	1.67	1.16	1.30	1.33	.66	.98

CAL YR 1977 TOTAL 459657 MEAN 1259 MAX 4150 MTN 143 CFSM .79 IN 10.69  
WTR YR 1978 TOTAL 544787 MEAN 1493 MAX 8330 MTN 333 CFSM .93 IN 12.67

STREAMS TRIBUTARY TO LAKE MICHIGAN

179

04108600 RABBIT RIVER NEAR HOPKINS, MI

LOCATION.--Lat 42°38'32", long 85°43'19", in SE¼ sec.16, T.3 N., R.12 W., Allegan County, Hydrologic Unit 04050003, on left bank at downstream side of bridge on 18th Street, 2.5 mi (4.0 km) northeast of Hopkins.

DRAINAGE AREA.--71.4 mi² (184.9 km²).

PERIOD OF RECORD.--October 1965 to current year.

GAGE.--Water-stage recorder. Altitude of gage is 700 ft (213 m) from topographic map (nearest 10 ft).

REMARKS.--Records good except those for the winter period, which are poor. Several observations of water temperature were made during the year.

AVERAGE DISCHARGE.--13 years, 55.3 ft³/s (1.566 m³/s), 10.52 in/yr (267 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,180 ft³/s (33.4 m³/s) June 26, 1978, gage height, 9.56 ft (2.914 m); minimum not determined; minimum daily, 9.2 ft³/s (0.26 m³/s) Aug. 27, 28, 1970, Sept. 18, 1971; minimum gage height, 1.89 ft (0.576 m) Aug. 28, 1977.

EXTREMES FOR CURRENT YEAR.--Peak discharges above base of 300 ft³/s (8.50 m³/s) and maximum (\*):

Date	Time	Discharge (ft³/s) (m³/s)	Gage height (ft) (m)	Date	Time	Discharge (ft³/s) (m³/s)	Gage height (ft) (m)
Mar. 24	0100	361 10.2	7.27 2.216	Sept. 13	2000	645 18.3	7.99 2.435
Apr. 6	2300	302 8.55	6.89 2.100	Sept. 18	2400	590 16.7	7.88 2.402
June 26	1500	*1180 33.4	*9.56 2.914				

Minimum discharge, 16 ft³/s (0.45 m³/s) Sept. 9, 10, 11; minimum gage height, 2.20 ft (0.671 m) Sept. 11.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	32	20	45	33	31	29	145	34	22	90	23	19
2	41	22	50	33	31	29	120	33	22	111	22	19
3	34	23	45	33	31	29	106	32	20	105	32	18
4	29	21	40	33	31	29	96	31	20	76	27	18
5	26	20	36	33	31	29	88	33	20	60	23	18
6	24	19	32	33	31	29	176	33	20	52	22	18
7	23	19	30	33	31	29	251	32	20	46	21	17
8	27	20	29	33	31	29	170	32	24	47	21	17
9	34	20	29	32	31	29	150	34	23	42	29	16
10	31	20	29	32	31	29	125	33	21	38	29	16
11	29	21	30	32	31	29	115	32	19	35	24	16
12	31	21	31	32	31	40	105	49	20	32	22	28
13	31	22	32	32	31	60	90	100	20	31	21	349
14	28	22	35	32	31	120	75	129	19	31	20	434
15	27	21	50	32	31	187	68	129	19	29	19	252
16	25	23	65	32	30	140	62	87	19	27	29	207
17	24	24	93	32	30	121	58	65	21	26	31	224
18	23	24	121	32	30	108	54	55	22	25	25	446
19	24	25	146	32	30	100	53	47	22	24	29	443
20	24	25	117	32	30	142	52	45	20	25	33	309
21	23	28	102	32	30	289	50	59	19	37	27	165
22	22	28	77	32	30	344	48	48	18	38	23	116
23	22	27	63	32	30	341	45	41	18	43	22	88
24	21	25	58	32	30	315	46	38	17	36	21	72
25	21	24	51	32	30	201	44	35	18	31	20	62
26	21	23	45	31	30	123	41	32	675	29	20	55
27	21	23	40	31	30	104	39	30	615	29	21	51
28	21	25	34	31	30	140	38	28	409	27	23	52
29	20	30	33	31	---	201	36	26	249	25	25	48
30	20	36	33	31	---	160	35	24	107	24	21	46
31	20	---	33	31	---	137	---	23	---	24	20	---
TOTAL	799	701	1654	994	855	3692	2581	1449	2558	1295	745	3679
MEAN	25.8	23.4	53.4	32.1	30.5	119	86.0	46.7	85.3	41.8	24.0	123
MAX	41	36	146	33	31	344	251	129	675	111	33	443
MIN	20	19	29	31	30	29	35	23	17	24	19	16
CFSM	.36	.33	.75	.45	.43	1.67	1.20	.65	1.20	.59	.34	1.72
IN.	.42	.37	.86	.52	.45	1.92	1.34	.75	1.33	.67	.39	1.92

CAL YR 1977 TOTAL 12960 MEAN 35.5 MAX 258 MIN 11 CFSM .50 IN 6.75  
WTR YR 1978 TOTAL 21002 MEAN 57.5 MAX 675 MIN 16 CFSM .81 IN 10.94

04108690 KALAMAZOO RIVER AT SAUGATUCK, MI  
(National stream-quality accounting network and pesticide station)

LOCATION.--Lat 42°38'50", long 86°11'53", in NE¼ sec.16, T.3 N., R.16 W., Allegan County, Hydrologic Unit 04050003, at bridge on Old US-31 between Saugatuck and Douglas, 7.9 mi (12.7 km) downstream from Rabbit River, 17.6 mi (28.3 km) downstream from gaging station near Fennville and 2.9 mi (4.7 km) upstream from mouth.

DRAINAGE AREA.--2,020 mi<sup>2</sup> (5,230 km<sup>2</sup>), approximately.

PERIOD OF RECORD.--Water years 1974 to current year.

PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE: February 1974 to current year.

WATER TEMPERATURES: May 1975 to current year.

INSTRUMENTATION.--Water-quality monitor since Nov. 1, 1975.

REMARKS.--Water-quality monitor located 30 ft (9 m) from the right abutment of the bridge. Water-discharge measurements are made at times of monthly sampling.

COOPERATION.--Pesticide samples were collected by the U.S. Geological Survey and were analyzed by Environmental Protection Agency.

EXTREMES FOR PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE (water years 1974, 1975, 1978): Maximum recorded, 669 micromhos Mar. 8, 1978; minimum recorded, 172 micromhos Sept. 18, 1978.

WATER TEMPERATURES: Maximum recorded (water years 1977, 1978), 31.5°C July 20, 1977, minimum (water year 1978), 0.0°C on many days during winter period.

EXTREMES FOR CURRENT YEAR.--

WATER TEMPERATURES: Maximum, 28.0°C Aug. 15; minimum, 0.0°C on many days during winter period.

WATER QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DATE	TIME	STREAM- FLOW- INSTAN- TANEOUS (CFS)	SPE- CIFIC CON- DUCT- ANCE (MICRO- MHOS)	PH (UNITS)	TEMPER- ATURE (DEG C)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION)	COI I- FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML)	STREP- TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML)	HARD- NESS (MG/L AS CACO3)	HARD- NESS, NONCAR- BONATE (MG/L CACO3)
OCT												
04...	0930	1880	562	8.0	14.5	7.4	73	220	210	270	69	
NOV												
07...	1535	1040	626	8.2	14.0	8.7	86	--	--	280	59	
DEC												
05...	1315	1480	586	8.3	.5	--	--	K400	3600	260	55	
JAN												
10...	1600	1100	595	8.3	.0	--	--	66	120	280	75	
FEB												
07...	1415	860	612	8.0	.0	--	--	56	590	280	69	
MAR												
09...	1100	1300	612	8.0	.5	10.4	73	42	570	270	49	
APR												
03...	1715	4510	414	7.9	7.0	10.8	90	--	24	210	62	
MAY												
01...	1515	2280	529	8.7	11.0	11.2	104	K12	K26	270	75	
JUN												
05...	1545	1590	580	8.4	23.0	11.8	139	K480	K13	260	52	
JUL												
20...	1200	654	577	8.2	24.0	6.4	77	140	69	250	45	
AUG												
14...	1515	1450	545	8.8	26.5	16.0	200	K180	K270	230	37	
SEP												
11...	1545	950	587	8.7	26.0	12.6	158	K25	K36	250	43	

DATE	CALCIUM DIS- SOLVED (MG/L AS CA)	MAGNE- SIUM, DIS- SOLVED (MG/L AS MG)	SODIUM, DIS- SOLVED (MG/L AS NA)	SODIUM AD- SORP- TION RATIO	SODIUM PERCENT	POTAS- SIUM, DIS- SOLVED (MG/L AS K)	BICAR- BONATE (MG/L AS HCO3)	CAR- BONATE (MG/L AS CO3)	ALKA- LINITY (MG/L AS CACO3)	CARBON DIOXIDE DIS- SOLVED (MG/L AS CO2)	SULFATE DIS- SOLVED (MG/L AS SO4)
OCT											
04...	72	23	20	.5	14	2.6	250	0	210	4.0	54
NOV											
07...	75	23	24	.6	15	2.4	270	0	221	2.7	57
DEC											
05...	68	22	21	.6	15	2.6	250	0	210	2.0	63
JAN											
10...	74	23	20	.5	13	2.3	250	0	205	2.0	58
FEB											
07...	75	23	22	.6	14	2.0	260	0	210	4.2	58
MAR											
09...	73	22	24	.6	16	2.4	270	0	221	4.3	57
APR											
03...	57	16	10	.3	9	2.6	180	0	148	3.6	50
MAY											
01...	75	21	18	.5	12	1.9	240	1	200	.8	61
JUN											
05...	71	21	18	.5	13	2.1	250	4	210	1.6	49
JUL											
20...	69	20	19	.5	14	2.2	250	0	205	2.5	50
AUG											
14...	56	21	23	.7	18	2.1	210	10	189	.6	47
SEP											
11...	61	23	27	.7	19	2.2	224	12	204	.8	48

K--RESULTS BASED ON COLONY COUNT OUTSIDE THE ACCEPTABLE RANGE (NON-IDEAL COLONY COUNT)



## STREAMS TRIBUTARY TO LAKE MICHIGAN

181

04108690 KALAMAZOO RIVER AT SAUGATUCK, MI--CONTINUED

## WATER-QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978--CONTINUED

DATE	CHLORIDE, DIS- SOLVED (MG/L AS CL)	FLUORIDE, DIS- SOLVED (MG/L AS F)	SILICA, DIS- SOLVED (MG/L AS SiO2)	SOLIDS, RESIDUE AT 180 DEG. C DIS- SOLVED (MG/L)	SOLIDS, SUM OF CONSTITUENTS, DIS- SOLVED (MG/L)	SOLIDS, DIS- SOLVED (TONS PER DAY)	NITRO- GEN, NO2+NO3 TOTAL (MG/L AS N)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N)	NITRO- GEN, ORGANIC TOTAL (MG/L AS N)	NITRO- GEN,AM- MONIA + ORGANIC TOTAL (MG/L AS N)
OCT 04...	31	.1	7.7	346	334	1760	.84	.14	--	--
NOV 07...	36	.3	6.5	369	357	1040	.57	.14	--	--
DEC 05...	32	.2	8.5	372	341	1490	1.4	.33	--	--
JAN 10...	32	.1	9.6	376	342	1120	1.7	.44	--	--
FEB 07...	34	.1	10	366	352	850	.96	.45	.65	1.1
MAR 09...	36	.2	9.4	372	357	1310	.82	.43	.87	1.3
APR 03...	33	.2	6.8	281	264	3420	2.0	.12	.82	.94
MAY 01...	32	.1	1.8	355	330	2190	.34	.23	1.2	1.4
JUN 05...	31	.2	4.7	386	324	1660	.61	.09	1.2	1.3
JUL 20...	33	.1	5.1	348	322	614	.54	.13	1.1	1.2
AUG 14...	38	.2	.1	315	301	1230	.00	.11	1.7	1.8
SEP 11...	41	.2	1.2	318	326	816	.00	.05	1.7	1.7

DATE	NITRO- GEN, NH4 + ORG. SUSP. TOTAL (MG/L AS N)	NITRO- GEN, AM- MONIA + ORGANIC DIS. (MG/L AS N)	NITRO- GEN, TOTAL (MG/L AS N)	NITRO- GEN, TOTAL (MG/L AS NO3)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, DIS- SOLVED (MG/L AS P)	CARBON, ORGANIC TOTAL (MG/L AS C)	SEDI- MENT, SUS- PENDED (MG/L)	SEDI- MENT DIS- CHARGE, SUS- PENDED (T/DAY)	SFD, SUSP. SIEVE DIAM. % FINER THAN .062 MM
OCT 04...	--	.60	--	--	.17	.05	--	27	137	100
NOV 07...	--	.52	--	--	.12	.03	11	30	84	100
DEC 05...	--	.04	--	--	.10	.04	--	7	28	100
JAN 10...	--	.08	--	--	.07	.05	--	9	27	100
FEB 07...	.00	1.1	2.1	9.1	.10	.06	8.4	4	9.3	100
MAR 09...	.10	1.2	2.1	9.4	.09	.04	1.7	7	25	100
APR 03...	.05	.89	2.9	13	.07	.01	--	14	170	100
MAY 01...	.86	.54	1.7	7.7	.12	.01	11	20	123	100
JUN 05...	.69	.61	1.9	8.5	.16	.05	10	12	52	100
JUL 20...	.26	.94	1.7	7.7	.12	.05	--	15	26	100
AUG 14...	1.2	.56	1.8	8.0	.15	.01	6.9	29	114	100
SEP 11...	1.2	.51	1.7	7.5	.15	.01	6.3	28	72	100

STREAMS TRIBUTARY TO LAKE MICHIGAN  
04108690 KALAMAZOO RIVER AT SAUGATUCK, MI--CONTINUED

## WATER-QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978--CONTINUED

DATE	TIME	ARSENIC TOTAL (UG/L AS AS)	ARSENIC DIS- SOLVED (UG/L AS AS)	BARIUM, TOTAL RECOV- ERABLE (UG/L AS BA)	BARIUM, DIS- SOLVED (UG/L AS BA)	CADMIUM TOTAL RECOV- ERABLE (UG/L AS CD)	CADMIUM DIS- SOLVED (UG/L AS CD)	CHRO- MIUM, TOTAL RECOV- ERABLE (UG/L AS CR)	CHRO- MIUM, DIS- SOLVED (UG/L AS CR)	COBALT, TOTAL RECOV- ERABLE (UG/L AS CO)
OCT 04...	0930	1	1	0	0	0	0	<10	1	0
JAN 10...	1600	0	0	0	0	8	1	10	0	0
APR 03...	1715	2	2	0	0	1	0	10	1	10
JUL 20...	1200	3	2	0	0	1	0	20	0	0

DATE	COBALT, DIS- SOLVED (UG/L AS CO)	COPPER, TOTAL RECOV- ERABLE (UG/L AS CU)	COPPER, DIS- SOLVED (UG/L AS CU)	IRON, TOTAL RECOV- ERABLE (UG/L AS FE)	IRON, DIS- SOLVED (UG/L AS FE)	LEAD, TOTAL RECOV- ERABLE (UG/L AS PB)	LEAD, DIS- SOLVED (UG/L AS PB)	MANGA- NESE, TOTAL RECOV- ERABLE (UG/L AS MN)	MANGA- NESE, DIS- SOLVED (UG/L AS MN)	MERCURY TOTAL RECOV- ERABLE (UG/L AS HG)
OCT 04...	0	6	3	1100	30	7	7	110	20	<.5
JAN 10...	0	8	3	590	60	--	9	60	50	<.5
APR 03...	4	7	2	800	120	20	2	50	30	<.5
JUL 20...	0	4	4	440	10	10	0	80	10	.5

DATE	MERCURY DIS- SOLVED (UG/L AS HG)	SELE- NIUM, TOTAL (UG/L AS SE)	SELE- NIUM, DIS- SOLVED (UG/L AS SE)	SILVER, TOTAL RECOV- ERABLE (UG/L AS AG)	SILVER, DIS- SOLVED (UG/L AS AG)	ZINC, TOTAL RECOV- ERABLE (UG/L AS ZN)	ZINC, DIS- SOLVED (UG/L AS ZN)	CARBON, ORGANIC DIS- SOLVED (MG/L AS C)	CARBON, ORGANIC SUS- PENDED TOTAL (MG/L AS C)
OCT 04...	<.5	0	0	0	0	20	10	11	--
JAN 10...	<.5	0	0	0	0	20	20	5.8	--
APR 03...	<.5	0	0	1	0	20	0	5.7	2.0
JUL 20...	.5	0	0	0	0	20	0	8.1	--

QUALITATIVE AND ASSOCIATED QUANTITATIVE ANALYSES OF BIOLOGICAL DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
PERIPHYTON

DATE	TIME	LENGTH OF EXPO- SURE (DAYS)	PERI- PHYTON BIOMASS ASH WEIGHT G/SQ M	PERI- PHYTON BIOMASS TOTAL DRY WEIGHT G/SQ M	CHLOR-A PERI- PHYTON CHROMO- GRAPHIC FLUOROM (MG/M2)	CHLOR-B PERI- PHYTON CHROMO- GRAPHIC FLUOROM (MG/M2)
MAR 09...	1100	30	1.02	1.50	.300	.000
MAY 01...	1515	28	8.03	9.45	13.4	1.51
AUG 14...	1515	25	23.6	26.5	18.7	5.30

## 04108690 KALAMAZOO RIVER AT SAUGATUCK, MI--CONTINUED

## WATER-QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978--CONTINUED

DATE	TIME	PCB, TOTAL (UG/L)	AROCLO TOT. IN BOT MAT 1254 PCB SERIES (UG/KG)	ALDRIN, TOTAL (UG/L)	ALDRIN, TOTAL IN BOT- TOM MA- TERIAL (UG/KG)	ATRA- ZINE, TOTAL (UG/L)	ATRA- ZINE, TOTAL IN BOT- TOM MA- TERIAL (UG/KG)	CHLOR- DANE, TOTAL (UG/L)	CHLOR- DANE, TOTAL IN BOT- TOM MA- TERIAL (UG/KG)	DDD, TOTAL (UG/L)	DDD, TOTAL IN BOT- TOM MA- TERIAL (UG/KG)
NOV 07...	1535	ND	24	ND	ND	ND	ND	ND	ND	ND	ND
FEB 07...	1415	--	--	ND	--	ND	--	ND	--	ND	--
MAY 01...	1515	ND	6	ND	ND	ND	--	ND	ND	ND	ND
AUG 14...	1515	ND	--	ND	--	--	--	ND	--	ND	--

DATE	DDE, TOTAL (UG/L)	DDE, TOTAL IN BOT- TOM MA- TERIAL (UG/KG)	DDT, TOTAL (UG/L)	DDT, TOTAL IN BOT- TOM MA- TERIAL (UG/KG)	DI- AZINON, TOTAL (UG/L)	DI- AZINON, TOTAL IN BOT- TOM MA- TERIAL (UG/KG)	DI- ELDRIN, TOTAL (UG/L)	DI- ELDRIN, TOTAL IN BOT- TOM MA- TERIAL (UG/KG)	ENDRIN, TOTAL (UG/L)	ENDRIN, TOTAL IN BOT- TOM MA- TERIAL (UG/KG)
NOV 07...	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
FEB 07...	ND	--	ND	--	ND	--	ND	--	ND	--
MAY 01...	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
AUG 14...	ND	--	ND	--	ND	--	ND	--	ND	--

DATE	ETHION, TOTAL (UG/L)	ETHION, TOTAL IN BOT- TOM MA- TERIAL (UG/KG)	HEPTA- CHLOR, TOTAL (UG/L)	HEPTA- CHLOR, TOTAL IN BOT- TOM MA- TERIAL (UG/KG)	HEPTA- CHLOR EPOXIDE TOT. IN BOT- TOM MA- TERIAL (UG/L)	HEPTA- CHLOR EPOXIDE TOT. IN BOT- TOM MA- TERIAL (UG/KG)	LINDANE TOTAL (UG/L)	LINDANE TOTAL IN BOT- TOM MA- TERIAL (UG/KG)	MALA- THION, TOTAL (UG/L)	MALA- THION, TOTAL IN BOT- TOM MA- TERIAL (UG/KG)
NOV 07...	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
FEB 07...	ND	--	ND	--	ND	--	ND	--	ND	--
MAY 01...	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
AUG 14...	ND	--	ND	--	ND	--	ND	--	ND	--

DATE	METH- OXY- CHLOR, TOTAL (UG/L)	METH- OXY- CHLOR, TOTAL IN BOT- TOM MA- TERIAL (UG/KG)	METHYL PARA- THION, TOTAL (UG/L)	METHYL PARA- THION, TOTAL IN BOT- TOM MA- TERIAL (UG/KG)	METHYL TRI- THION, TOTAL (UG/L)	METHYL TRI- THION, TOTAL IN BOT- TOM MA- TERIAL (UG/KG)	PARA- THION, TOTAL (UG/L)	PARA- THION, TOTAL IN BOT- TOM MA- TERIAL (UG/KG)	SIMA- ZINE TOTAL COND. (UG/L)	SIMA- ZINE IN BOT- TOM MA- TERIAL (UG/KG DRY SOLIDS)
NOV 07...	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
FEB 07...	ND	--	ND	--	ND	--	ND	--	ND	--
MAY 01...	ND	ND	ND	ND	ND	ND	ND	ND	ND	--
AUG 14...	ND	--	ND	--	ND	--	ND	--	--	--

DATE	TOX- APHENE, TOTAL (UG/L)	TOXA- PHENE, TOTAL IN BOT- TOM MA- TERIAL (UG/KG)	TOTAL TRI- THION (UG/L)	TRI- THION, TOTAL IN BOT- TOM MA- TERIAL (UG/KG)	2,4-D, TOTAL (UG/L)	2,4-D, TOTAL IN BOT- TOM MA- TERIAL (UG/KG)	2,4,5-T TOTAL (UG/L)	2,4,5-T TOTAL IN BOT- TOM MA- TERIAL (UG/KG)	SILVEX, TOTAL (UG/L)	SILVEX, TOTAL IN BOT- TOM MA- TERIAL (UG/KG)
NOV 07...	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
FEB 07...	ND	--	ND	--	ND	--	ND	--	ND	--
MAY 01...	ND	ND	ND	ND	--	--	--	--	--	--
AUG 14...	ND	--	ND	--	--	--	--	--	--	--

ND--Not detected

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
	OCTOBER			NOVEMBER			DECEMBER			JANUARY		
1	476	309	357	356	239	295	---	---	---	463	413	437
2	499	399	455	385	244	312	---	---	---	503	470	495
3	505	485	496	461	368	415	---	---	---	552	504	527
4	550	488	518	572	436	496	---	---	---	555	481	518
5	536	517	526	569	541	557	---	---	---	531	491	518
6	548	535	540	564	531	552	539	531	535	524	494	511
7	548	495	529	544	506	529	565	536	550	494	333	390
8	447	277	338	610	501	565	562	547	554	497	334	404
9	459	403	433	596	407	546	572	554	562	525	497	517
10	500	284	433	548	445	513	582	540	568	534	524	528
11	496	349	430	596	505	562	579	560	567	537	471	516
12	520	312	479	638	594	620	574	371	469	530	491	510
13	553	306	448	634	624	630	371	296	333	512	334	451
14	565	469	543	639	622	630	333	323	328	545	362	489
15	566	552	558	---	---	---	338	321	328	560	514	545
16	580	558	568	---	---	---	351	304	327	567	536	551
17	580	562	574	---	---	---	365	335	352	573	427	539
18	577	425	509	---	---	---	354	317	334	594	552	575
19	522	434	468	---	---	---	328	314	320	605	589	595
20	530	312	463	---	---	---	340	297	310	598	589	594
21	577	296	497	---	---	---	377	291	335	605	505	589
22	581	562	574	---	---	---	369	293	334	593	585	589
23	576	556	567	---	---	---	332	294	314	628	597	612
24	585	546	567	---	---	---	386	282	332	613	602	605
25	582	500	551	---	---	---	480	397	460	610	601	605
26	536	317	463	---	---	---	487	459	471	603	579	588
27	511	294	443	---	---	---	474	468	471	605	591	597
28	575	331	515	---	---	---	483	444	462	605	596	600
29	566	503	547	---	---	---	454	338	420	606	602	603
30	581	510	551	---	---	---	469	325	409	605	590	599
31	560	269	484	---	---	---	480	366	446	605	599	601
MONTH	585	269	498							628	333	542

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
	FEBRUARY			MARCH			APRIL			MAY		
1	616	607	610	609	552	577	---	---	---	580	574	576
2	613	606	609	592	554	573	---	---	---	---	---	---
3	610	417	562	611	569	589	---	---	---	---	---	---
4	597	524	580	601	551	571	---	---	---	---	---	---
5	602	465	584	597	569	582	---	---	---	---		

## 04108690 KALAMAZOO RIVER AT SAUGATUCK, MI--CONTINUED

SPECIFIC CONDUCTANCE (MICROMHOS/CM AT 25 DEG. C), WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
	JUNE			JULY			AUGUST			SEPTEMBER		
1	---	---	---	354	240	277	551	460	511	575	554	562
2	---	---	---	272	255	264	556	316	453	579	564	571
3	---	---	---	414	275	322	523	330	405	577	568	574
4	---	---	---	455	412	428	555	508	529	581	561	575
5	---	---	---	475	430	454	557	526	544	586	562	576
6	574	564	570	495	459	479	566	538	552	585	554	575
7	581	254	370	525	495	506	572	562	567	588	574	581
8	294	269	279	540	527	534	569	545	558	580	563	572
9	394	300	336	542	528	534	561	287	342	569	548	559
10	557	383	462	538	529	534	527	371	449	560	536	546
11	578	555	568	544	534	539	536	502	519	550	537	544
12	598	307	426	555	534	545	532	503	521	257	225	238
13	561	503	536	561	549	554	523	501	514	241	184	207
14	574	549	568	587	547	565	529	486	512	184	175	179
15	586	564	573	591	581	587	531	507	519	222	181	198
16	595	302	405	585	577	581	512	235	302	251	193	214
17	412	303	364	584	578	581	469	379	413	274	173	191
18	488	436	466	588	580	584	470	280	406	185	172	180
19	553	469	501	592	584	589	386	234	289	209	182	192
20	623	542	576	603	365	567	468	348	395	297	212	252
21	617	607	613	363	311	330	500	465	482	289	216	242
22	617	606	612	402	305	329	524	489	504	330	246	281
23	624	594	615	460	370	414	517	504	511	366	309	337
24	618	591	607	536	450	484	520	419	490	394	348	372
25	625	295	449	556	505	534	506	494	501	439	398	415
26	291	227	263	552	358	481	522	491	507	458	427	443
27	325	227	253	507	359	426	523	406	492	466	386	450
28	350	314	335	545	518	534	503	472	489	481	453	464
29	310	273	285	539	523	529	544	494	522	499	476	485
30	336	286	304	556	533	542	545	523	536	496	306	405
31	---	---	---	561	479	547	560	533	549	---	---	---
MONTH				603	240	489	572	234	480	588	172	399

## TEMPERATURE (DEG. C) OF WATER, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
	OCTOBER			NOVEMBER			DECEMBER			JANUARY		
1	16.5	14.5	15.0	13.0	8.5	10.0	---	---	---	.5	.5	.5
2	16.0	13.5	15.0	14.0	8.0	11.5	---	---	---	.5	.5	.5
3	17.0	14.0	15.5	15.0	13.0	14.0	---	---	---	1.0	1.0	1.0
4	19.0	14.5	16.5	15.0	11.5	14.0	---	---	---	1.0	1.0	1.0
5	16.5	15.5	16.0	13.0	10.0	11.5	---	---	---	1.0	1.0	1.0
6	16.0	14.0	15.0	14.0	10.5	12.5	.5	.0	.0	1.0	1.0	1.0
7	14.0	11.5	13.0	14.5	13.5	14.0	.5	.0	.0	1.0	1.0	1.0
8	12.5	10.5	11.5	15.5	14.0	15.0	.0	.0	.0	1.0	1.0	1.0
9	12.5	11.0	11.5	17.0	13.0	15.0	.5	.0	.0	1.0	1.0	1.0
10	15.0	9.5	12.5	13.5	8.5	10.0	.5	.0	.0	1.0	1.0	1.0
11	13.0	10.5	11.5	9.0	6.0	7.5	.0	.0	.0	1.0	.5	1.0
12	10.5	9.0	10.0	8.5	5.0	6.5	.5	.0	.0	1.0	.5	.5
13	12.5	7.5	10.0	7.5	3.5	5.5	.5	.5	.5	1.5	.5	1.0
14	14.5	8.5	11.5	8.0	3.5	5.5	.5	.5	.5	1.0	.0	.5
15	12.5	11.0	11.5	---	---	---	.5	.5	.5	1.0	.0	.5
16	12.0	9.0	10.5	---	---	---	1.0	.5	.5	1.0	.0	.5
17	14.0	7.0	10.0	---	---	---	1.5	.5	.5	1.0	.0	.5
18	10.5	10.0	10.0	---	---	---	2.0	.5	1.0	1.5	.0	.5
19	12.0	9.5	10.5	---	---	---	2.0	.5	1.5	1.0	.0	.5
20	14.5	8.5	11.0	---	---	---	2.5	.5	2.0	.5	.0	.0
21	15.0	9.5	12.5	---	---	---	.5	.5	.5	1.0	.0	.5
22	12.5	11.0	12.0	---	---	---	.5	.5	.5	.0	.0	.0
23	11.0	9.5	10.0	---	---	---	1.5	.5	.5	1.0	.0	.5
24	14.5	9.0	11.5	---	---	---	2.0	.5	1.0	.5	.0	.5
25	14.5	12.5	13.5	---	---	---	.5	.5	.5	1.0	.5	.5
26	14.0	12.0	13.0	---	---	---	.5	.5	.5	.5	.0	.0
27	12.5	11.5	12.0	---	---	---	.5	.5	.5	.0	.0	.0
28	14.5	10.0	12.5	---	---	---	.5	.5	.5	.0	.0	.0
29	12.5	10.5	11.5	---	---	---	.5	.5	.5	.0	.0	.0
30	12.5	8.0	10.5	---	---	---	1.0	.5	1.0	.0	.0	.0
31	13.5	8.5	10.5	---	---	---	.5	.5	.5	.0	.0	.0
MONTH	19.0	7.0	12.0							1.5	.0	.5



## STREAMS TRIBUTARY TO LAKE MICHIGAN

04108690 KALAMAZOO RIVER AT SAUGATUCK, MI--CONTINUED

TEMPERATURE (DEG. C) OF WATER, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
FEBRUARY			MARCH			APRIL			MAY			
1	.0	.0	.0	.0	.0	.0	---	---	---	13.5	8.5	11.5
2	.0	.0	.0	.0	.0	.0	---	---	---	---	---	---
3	.0	.0	.0	.0	.0	.0	---	---	---	---	---	---
4	.0	.0	.0	.0	.0	.0	---	---	---	---	---	---
5	.0	.0	.0	.0	.0	.0	---	---	---	---	---	---
6	.0	.0	.0	.0	.0	.0	---	---	---	---	---	---
7	.0	.0	.0	.0	.0	.0	---	---	---	---	---	---
8	.0	.0	.0	.0	.0	.0	---	---	---	---	---	---
9	.0	.0	.0	.0	.0	.0	---	---	---	---	---	---
10	.0	.0	.0	.5	.0	.0	---	---	---	---	---	---
11	.0	.0	.0	.0	.0	.0	---	---	---	---	---	---
12	.0	.0	.0	.0	.0	.0	---	---	---	---	---	---
13	.0	.0	.0	.0	.0	.0	12.5	7.5	9.0	---	---	---
14	.0	.0	.0	.0	.0	.0	13.5	7.0	10.0	---	---	---
15	.0	.0	.0	.5	.0	.5	14.0	8.0	11.0	---	---	---
16	.0	.0	.0	2.0	.5	1.0	14.5	8.0	11.0	---	---	---
17	.0	.0	.0	2.5	.0	1.5	14.5	7.5	11.0	---	---	---
18	.0	.0	.0	4.0	.0	1.0	10.0	8.5	9.5	---	---	---
19	.0	.0	.0	3.0	1.5	2.0	10.5	8.5	9.5	---	---	---
20	.0	.0	.0	3.5	1.0	2.5	9.0	3.0	6.0	---	---	---
21	.0	.0	.0	2.5	1.0	2.0	10.5	3.0	7.0	---	---	---
22	.0	.0	.0	2.5	.5	1.5	13.0	6.5	10.0	---	---	---
23	.0	.0	.0	4.0	1.5	2.5	10.5	6.0	8.0	---	---	---
24	.0	.0	.0	3.0	1.0	2.0	12.0	5.0	8.0	---	---	---
25	.0	.0	.0	2.5	.5	1.5	14.0	8.5	11.0	---	---	---
26	.0	.0	.0	3.0	.5	2.0	14.5	9.5	12.5	---	---	---
27	.0	.0	.0	---	---	---	15.5	12.0	14.0	---	---	---
28	.0	.0	.0	---	---	---	16.5	12.5	14.5	---	---	---
29	---	---	---	---	---	---	16.0	13.5	14.5	---	---	---
30	---	---	---	---	---	---	15.0	10.5	13.0	---	---	---
31	---	---	---	---	---	---	---	---	---	---	---	---
MONTH	.0	.0	.0									

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
JUNE			JULY			AUGUST			SEPTEMBER			
1	---	---	---	22.5	16.0	18.0	25.5	21.5	23.5	25.5	21.5	23.5
2	---	---	---	16.0	15.0	15.5	25.0	16.5	21.0	25.5	22.0	24.0
3	---	---	---	21.0	15.0	18.0	23.0	16.5	19.0	25.0	23.0	24.0
4	---	---	---	23.0	19.5	21.5	24.0	21.0	22.5	25.0	22.0	23.5
5	---	---	---	25.0	20.5	22.0	24.5	21.0	23.0	25.5	22.0	24.0
6	24.0	20.5	22.0	25.5	21.0	23.0	24.5	21.5	23.0	26.0	22.5	24.5
7	23.0	12.5	16.5	25.5	23.0	24.5	24.0	22.0	23.0	26.0	22.5	24.5
8	13.5	11.5	12.5	25.0	22.0	23.5	25.0	21.5	23.5	27.0	24.5	25.5
9	18.0	12.0	14.5	25.0	21.0	23.0	24.5	14.0	17.5	27.0	24.5	26.0
10	22.5	16.0	19.0	24.5	21.0	23.0	25.0	20.5	22.5	27.0	25.5	26.5
11	24.0	19.5	22.0	23.5	21.0	22.0	25.0	22.0	24.0	27.0	25.5	26.5
12	23.0	14.0	18.5	24.0	20.5	22.0	26.0	23.0	24.5	17.0	13.0	15.0
13	20.5	18.5	19.5	23.0	22.0	22.5	27.0	24.0	25.5	12.5	10.0	11.0
14	19.5	17.0	18.5	25.0	21.5	23.0	27.5	25.0	26.5	12.0	10.5	11.0
15	20.5	17.0	18.5	25.0	23.0	24.0	28.0	25.0	26.5	15.0	11.5	13.0
16	20.0	11.0	15.0	24.5	22.5	23.5	27.0	16.0	19.5	16.5	12.0	14.0
17	18.0	11.5	15.5	24.0	21.5	23.0	26.5	21.0	23.0	16.5	12.0	13.0
18	21.0	17.5	19.5	24.5	22.0	23.5	25.5	18.0	22.5	12.5	11.5	12.0
19	23.0	19.0	21.0	25.0	23.0	24.0	21.5	15.5	18.0	15.0	12.0	13.0
20	24.0	20.5	22.5	26.5	19.5	24.5	24.5	19.0	21.5	20.0	14.5	17.0
21	24.0	21.0	22.5	19.5	15.5	17.0	25.0	21.0	23.0	19.0	14.5	15.5
22	23.5	20.5	22.0	20.5	14.0	17.0	26.0	21.5	24.0	18.5	14.5	16.0
23	23.0	20.5	22.0	22.0	17.0	20.0	26.5	23.0	25.0	18.5	16.0	17.0
24	24.5	20.5	22.5	24.0	20.5	22.0	26.0	22.0	24.5	19.0	16.0	17.5
25	24.0	10.0	18.0	25.0	22.0	23.5	25.5	24.0	24.5	19.0	16.5	17.5
26	14.5	9.0	12.5	24.5	18.0	22.0	25.5	22.5	24.0	18.5	16.0	17.0
27	18.0	13.0	15.0	24.5	17.0	21.0	25.5	21.5	24.0	17.5	16.0	16.5
28	21.0	17.0	19.0	25.0	21.5	23.5	24.5	22.0	23.5	17.5	15.0	16.0
29	22.5	18.5	20.5	24.5	22.5	23.5	25.0	22.0	24.0	17.5	14.0	16.0
30	23.5	20.5	21.5	24.0	21.0	22.5	24.5	22.5	24.0	16.5	12.0	14.5
31	---	---	---	24.5	21.0	23.0	25.0	21.5	23.5	---	---	---
MONTH				26.5	14.0	22.0	28.0	14.0	23.0	27.0	10.0	18.5

STREAMS TRIBUTARY TO LAKE MICHIGAN

187

04108800 BLACK RIVER NEAR ZEELAND, MI

LOCATION.--Lat 42°46'40", long 86°01'06", in NW¼ sec.31, T.5 N., R.14 W., Ottawa County, Hydrologic Unit 04050002, on left bank 20 ft (6 m) upstream from bridge on State Road, 0.2 mi (0.3 km) downstream from South Branch, and 2.5 mi (4.0 km) south of Zeeland.

DRAINAGE AREA.--65.8 mi² (170.4 km²).

PERIOD OF RECORD.--October 1960 to current year.

GAGE.--Water-stage recorder. Altitude of gage is 590 ft (180 m) from topographic map.

REMARKS.--Records good except those for the winter period, which are fair. Several observations of water temperature were made during the year.

AVERAGE DISCHARGE.--18 years, 61.3 ft³/s (1.736 m³/s), 12.65 in/yr (321 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 3,830 ft³/s (108 m³/s) June 26, 1978, gage height, 14.03 ft (4.276 m); minimum, 0.9 ft³/s (0.025 m³/s) Aug. 24, 1962; minimum gage height, 1.79 ft (0.546 m) Sept. 30, Oct. 3, 1969.

EXTREMES FOR CURRENT YEAR.--Peak discharges above base of 900 ft³/s (25.5 m³/s) and maximum (\*):

Date	Time	Discharge (ft³/s) (m³/s)	Gage height (ft) (m)	Date	Time	Discharge (ft³/s) (m³/s)	Gage height (ft) (m)
Mar. 24	0100	1060 30.0	10.30 3.139	June 26	1600	*3830 108	*14.03 4.276
Apr. 7	0200	1300 36.8	10.68 3.255	Sept. 15	0400	1400 39.6	10.74 3.274

Minimum discharge, 3.6 ft³/s (0.102 m³/s) Sept. 9, 10, 11, gage height, 2.02 ft (0.616 m).

DISCHARGE. IN CUBIC FEET PER SECOND. WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	24	10	296	28	31	34	523	13	9.4	153	10	6.2
2	26	41	557	28	31	34	135	12	8.3	255	43	5.8
3	15	39	173	28	31	34	102	11	8.1	166	77	5.6
4	10	22	80	28	31	35	111	11	8.0	74	19	5.3
5	7.9	15	51	28	31	35	86	13	8.5	50	13	5.2
6	6.9	12	36	28	31	35	538	13	8.1	38	10	5.0
7	6.3	10	27	28	31	35	947	12	8.4	32	9.5	4.9
8	11	9.8	24	28	31	35	204	13	9.9	27	8.9	5.3
9	22	9.3	23	28	31	36	102	13	9.5	24	34	4.3
10	16	10	22	28	32	36	166	12	8.5	21	15	4.0
11	16	24	23	28	32	36	391	13	7.3	18	10	3.9
12	32	34	24	28	32	40	114	32	9.5	17	9.0	16
13	29	22	25	28	32	50	67	334	9.7	16	8.1	457
14	19	17	60	28	32	100	50	461	7.9	15	7.5	935
15	14	15	150	29	32	320	41	191	8.3	13	7.1	1140
16	11	17	280	29	32	500	35	88	8.7	11	43	725
17	9.0	16	440	29	32	569	31	57	12	11	26	594
18	9.1	15	350	29	32	446	30	41	20	11	13	732
19	12	14	260	29	33	365	32	31	13	10	212	447
20	10	40	212	29	33	522	31	155	9.5	10	94	131
21	9.5	67	244	29	33	821	29	99	8.0	15	30	109
22	9.0	34	128	29	33	965	24	39	7.0	25	19	100
23	8.2	21	114	30	33	986	23	28	6.3	21	14	55
24	7.6	22	106	30	33	968	24	23	5.9	15	12	40
25	7.3	26	157	30	33	373	21	19	5.7	12	11	31
26	7.3	22	90	30	34	139	19	17	2060	38	10	25
27	7.1	20	50	30	34	143	17	15	1520	68	9.9	24
28	6.9	19	35	30	34	440	15	13	717	21	9.1	24
29	6.9	16	30	30	---	758	14	12	252	14	8.3	21
30	6.6	25	28	30	---	369	14	11	88	12	7.4	24
31	6.7	---	28	30	---	373	---	10	---	10	6.7	---
TOTAL	389.3	664.1	4123	894	900	9632	3936	1812	4862.5	1223	806.5	5687.5
MEAN	12.6	22.1	133	28.8	32.1	311	131	58.5	162	39.5	26.0	190
MAX	32	67	557	30	34	986	947	461	2060	255	212	1140
MIN	6.3	9.3	22	28	31	34	14	10	5.7	10	6.7	3.9
CFSM	.19	.34	2.02	.44	.49	4.73	1.99	.89	2.46	.60	.40	2.89
IN.	.22	.38	2.33	.51	.51	5.45	2.23	1.02	2.75	.69	.46	3.22

CAL YR 1977 TOTAL 13857.3 MEAN 38.0 MAX 642 MTN 1.7 CFSM .58 IN 7.83  
WTR YR 1978 TOTAL 34929.9 MEAN 95.7 MAX 2060 MTN 3.9 CFSM 1.45 IN 19.75

## STREAMS TRIBUTARY TO LAKE MICHIGAN

04109000 GRAND RIVER AT JACKSON, MI

LOCATION.--Lat 42°17'05", long 84°24'30", in sec.22, T.2 S., R.1 W., Jackson County, Hydrologic Unit. 04050004, on left bank of sewage-treatment plant, 1 mi (2 km) north of Jackson, 2.2 mi (3.5 km) upstream from Portage River, and at mile 216 (348 km).

DRAINAGE AREA.--174 mi<sup>2</sup> (451 km<sup>2</sup>).

PERIOD OF RECORD.--April 1935 to current year.

REVISED RECORDS.--WSP 974: 1937 (M). WSP 1387: 1936. WSP 1727: 1950 (M).

GAGE.--Water-stage recorder. Datum of gage is 900.00 ft (274.320 m) Fargo Engineering Co. datum. Prior to Sept. 24, 1935, nonrecording gage at same site and datum.

REMARKS.--Records good. Slight regulation by mills above station. Flow includes about 17 ft<sup>3</sup>/s (0.48 m<sup>3</sup>/s) as sewage effluent from the city of Jackson, which originates from ground water sources. Several observations of water temperature were made during the year.

AVERAGE DISCHARGE.--43 years, 120 ft<sup>3</sup>/s (3.398 m<sup>3</sup>/s), 9.37 in/yr (238 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,070 ft<sup>3</sup>/s (30.3 m<sup>3</sup>/s) June 25, 1937, gage height, 13.50 ft (4.115 m); maximum gage height, 15.44 ft (4.706 m) June 25, 1968; minimum discharge, 9.2 ft<sup>3</sup>/s (0.26 m<sup>3</sup>/s) Aug. 22, 1936.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 504 ft<sup>3</sup>/s (14.3 m<sup>3</sup>/s) Apr. 4, gage height, 11.86 ft (3.615 m); minimum, 23 ft<sup>3</sup>/s (0.65 m<sup>3</sup>/s) Sept. 4, gage height, 8.20 ft (2.499 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	154	68	120	110	134	68	428	129	78	82	43	36
2	122	117	106	96	132	69	390	122	78	150	51	31
3	76	115	158	102	119	66	404	162	126	146	132	27
4	72	59	155	160	65	63	447	161	74	141	89	26
5	68	45	164	169	59	115	453	161	67	99	38	34
6	65	42	156	150	68	124	470	155	66	86	33	35
7	59	52	83	92	70	117	453	99	76	84	40	35
8	70	53	82	90	70	66	428	108	140	75	41	35
9	98	54	88	82	72	76	416	159	130	65	41	30
10	118	75	87	90	72	126	411	158	75	68	40	27
11	68	120	79	90	68	123	380	160	56	70	39	34
12	59	56	96	135	70	126	354	215	72	70	35	95
13	54	44	163	149	129	129	333	202	69	79	30	73
14	52	51	194	128	136	118	282	213	65	111	37	103
15	50	66	178	70	136	154	249	244	66	50	40	123
16	44	131	181	79	125	158	231	253	129	38	66	106
17	62	130	186	77	71	160	228	256	128	46	42	91
18	115	74	248	76	64	162	230	249	88	47	40	67
19	106	56	227	74	59	171	222	212	81	46	36	115
20	52	74	274	74	69	196	268	239	65	46	30	103
21	49	135	248	75	72	296	286	213	75	98	37	58
22	49	125	240	121	71	333	278	207	63	56	38	54
23	43	75	236	139	73	381	272	226	61	57	38	47
24	49	64	239	135	126	400	274	198	60	49	38	40
25	50	67	219	79	126	410	273	182	112	47	37	47
26	51	64	196	50	112	429	263	168	183	47	33	46
27	60	60	190	54	70	450	226	102	178	47	43	48
28	111	131	185	54	69	464	206	79	142	44	46	44
29	53	141	142	58	---	442	147	72	85	39	39	43
30	41	136	136	120	---	446	129	79	82	34	37	44
31	50	---	171	136	---	462	---	75	---	41	36	---
TOTAL	2170	2480	5227	3114	2507	6900	9431	5258	2770	2158	1365	1697
MEAN	70.0	82.7	169	100	89.5	223	314	170	92.3	69.6	44.0	56.6
MAX	154	141	274	169	136	464	470	256	183	150	132	123
MIN	41	42	79	50	59	63	129	72	56	34	30	26
CFSM	.40	.48	.97	.58	.51	1.28	1.81	.98	.53	.40	.25	.33
IN.	.46	.53	1.12	.67	.54	1.48	2.02	1.12	.59	.46	.29	.36
CAL YR 1977	TOTAL	40034	MEAN 110	MAX 403	MIN 28	CFSM .63	IN 8.56					
WTR YR 1978	TOTAL	45077	MEAN 123	MAX 470	MIN 26	CFSM .71	IN 9.64					

STREAMS TRIBUTARY TO LAKE MICHIGAN

189

04111000 GRAND RIVER NEAR EATON RAPIDS, MI

LOCATION.--Lat 42°32'05", long 84°37'25", in NE¼ sec.26, T.2 N., R.3 W., Eaton County, Hydrologic Unit 04050004, on right bank 400 ft (122 m) upstream from bridge on Petrieville Highway, 2 mi (3 km) northeast of Eaton Rapids, 2.5 mi (4.0 km) downstream from Spring Brook, 25 mi (40 km) upstream from Red Cedar River at mile 178 (286 km).

DRAINAGE AREA.--661 mi<sup>2</sup> (1,712 km<sup>2</sup>).

PERIOD OF RECORD.--October 1950 to current year. Gage-height record for flood seasons collected in this vicinity 1905-28 are contained in reports of U.S. Weather Bureau.

REVISED RECORDS.--WSP 1707: 1951(M).

GAGE.--Water-stage recorder. Datum of gage is 852.68 ft (259.897 m) National Geodetic Vertical Datum of 1929 (levels by Michigan Department of Natural Resources).

REMARKS.--Records good except those for the winter period, which are fair. Diurnal fluctuation caused by powerplant at Smithville and mills at Eaton Rapids. Several observations of water temperature were made during the year.

AVERAGE DISCHARGE.--28 years, 456 ft<sup>3</sup>/s (12.91 m<sup>3</sup>/s), 9.37 in/yr (238 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 3,500 ft<sup>3</sup>/s (99.1 m<sup>3</sup>/s) Feb. 21, 1971; maximum gage height, 8.19 ft (2.496 m) June 28, 1968; minimum discharge, 14 ft<sup>3</sup>/s (0.40 m<sup>3</sup>/s) Dec. 20, 1962, Oct. 14, 1966; minimum gage height, 0.67 ft (0.204 m) Dec. 20, 1962; minimum daily discharge, 21 ft<sup>3</sup>/s (0.59 m<sup>3</sup>/s) Oct. 12, 1964.

EXTREMES OUTSIDE PERIOD OF RECORD.--Flood of Apr. 4, 1950, reached a stage of 8.15 ft (2.484 m), discharge, 3,860 ft<sup>3</sup>/s (109 m<sup>3</sup>/s).

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 2,020 ft<sup>3</sup>/s (57.2 m<sup>3</sup>/s) Mar. 25, Apr. 1, gage height, 5.89 ft (1.795 m); minimum, 41 ft<sup>3</sup>/s (1.16 m<sup>3</sup>/s) Sept. 9, gage height, 1.01 ft (0.308 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	258	172	339	520	220	270	1980	739	344	257	143	142
2	224	174	467	450	260	280	1990	585	331	296	149	46
3	304	168	430	400	270	280	1870	559	268	269	151	45
4	274	156	416	370	270	280	1760	537	307	346	177	141
5	215	208	300	370	260	280	1690	481	271	327	220	117
6	219	202	270	410	250	280	1730	451	297	309	176	122
7	191	222	230	450	250	280	1780	481	246	235	151	43
8	174	185	210	400	250	280	1750	480	251	227	148	130
9	189	188	220	340	250	290	1660	442	252	213	148	43
10	206	192	250	300	250	300	1580	410	304	204	148	43
11	220	195	270	270	250	320	1510	444	211	176	146	127
12	215	223	280	310	260	340	1440	478	303	173	54	145
13	210	234	293	320	260	379	1360	537	177	177	76	187
14	202	221	308	320	260	397	1260	613	238	172	141	212
15	163	180	416	310	270	493	1180	702	222	155	143	210
16	170	194	463	300	280	515	1080	793	222	183	141	78
17	178	255	493	280	280	547	1010	840	207	189	134	266
18	154	265	555	270	280	582	955	853	243	137	142	349
19	190	298	699	260	260	594	926	844	251	142	90	305
20	160	288	739	260	250	664	949	833	237	138	58	304
21	231	239	764	250	250	879	1000	873	231	134	149	229
22	194	304	755	250	250	1170	1040	902	229	142	137	235
23	151	297	778	260	250	1450	1020	889	220	176	138	205
24	174	308	767	260	250	1800	960	849	188	213	126	42
25	170	291	711	260	260	1910	924	804	168	175	126	209
26	169	239	450	230	260	1810	879	757	331	175	47	157
27	171	226	500	200	270	1690	837	692	476	167	50	206
28	172	216	530	190	270	1700	800	644	430	158	137	152
29	145	228	540	190	---	1900	772	583	381	146	132	171
30	157	281	560	200	---	1860	739	528	350	87	128	62
31	197	---	550	210	---	1860	---	483	---	159	127	---
TOTAL	6047	6849	14553	9410	7240	25680	38431	20106	8186	6057	4033	4753
MEAN	195	228	469	304	259	828	1281	649	273	195	130	158
MAX	304	308	778	520	280	1910	1990	902	476	346	220	349
MIN	145	156	210	190	220	270	739	410	168	87	47	43
CFSM	.30	.35	.71	.46	.39	1.25	1.94	.98	.41	.30	.20	.24
IN.	.34	.39	.82	.53	.41	1.45	2.16	1.13	.46	.34	.23	.27
CAL YR 1977	TOTAL	129064	MEAN 354	MAX 1480	MIN 40	CFSM .54	IN 7.26					
WTR YR 1978	TOTAL	151345	MEAN 415	MAX 1990	MIN 43	CFSM .63	IN 8.52					

## STREAMS TRIBUTARY TO LAKE MICHIGAN

04111379 RED CEDAR RIVER NEAR WILLIAMSTON, MI

LOCATION.--Lat 42°40'59", long 84°13'09", in NE¼ sec.4, T.3 N., R.2 E., Ingham County, Hydrologic Unit 04050004, on right bank, 20 ft (6 m) upstream from bridge on State Highway 52, 1.5 mi (2.4 km) upstream from Squaw Creek, and 3.5 mi (5.6 km) east of Williamston.

DRAINAGE AREA.--163 mi<sup>2</sup> (422 km<sup>2</sup>).

PERIOD OF RECORD.--July 1975 to current year.

GAGE.--Water-stage recorder. Altitude of gage is 870 ft (265 m) from topographic map (nearest 10 ft).

REMARKS.--Records good except those for the winter period, which are fair. Several observations of water temperature were made during the year. National Weather Service gage-height telemark at station.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 990 ft<sup>3</sup>/s (28.0 m<sup>3</sup>/s) Mar. 5, 6, 1976, gage height, 7.60 ft (2.316 m); minimum, 5.1 ft<sup>3</sup>/s (0.14 m<sup>3</sup>/s) Sept. 12, 1978, gage height, 2.03 ft (0.619 m).

EXTREMES FOR OUTSIDE PERIOD OF RECORD.--Flood of April 1975, reached a gage height of 10.41 ft (3.173 m) Apr. 19, and a discharge of 2,640 ft<sup>3</sup>/s (74.8 m<sup>3</sup>/s) Apr. 20.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 834 ft<sup>3</sup>/s (23.6 m<sup>3</sup>/s) Mar. 24, gage height, 6.91 ft (2.106 m); minimum, 5.1 ft<sup>3</sup>/s (0.14 m<sup>3</sup>/s) Sept. 12, gage height, 2.03 ft (0.619 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	32	29	60	66	28	38	606	67	41	23	12	8.9
2	37	32	100	64	30	38	563	62	39	26	12	9.2
3	36	33	110	61	31	38	512	60	38	27	19	9.1
4	32	33	105	60	33	38	483	59	37	26	19	8.4
5	30	31	85	59	34	38	455	61	36	24	18	7.9
6	28	32	65	59	35	38	432	66	34	22	16	7.6
7	27	33	50	59	37	39	425	65	34	21	15	6.9
8	28	32	45	58	38	40	400	62	38	21	14	6.7
9	32	34	45	57	39	40	373	65	42	22	14	6.8
10	32	37	45	56	40	40	355	70	39	21	14	6.8
11	32	38	47	53	40	40	332	67	36	18	12	6.2
12	32	37	49	50	40	40	301	78	36	18	12	6.7
13	31	35	52	47	40	45	277	109	36	17	12	8.7
14	30	34	64	44	40	55	244	178	36	17	11	9.9
15	30	35	82	43	40	85	207	230	34	17	11	11
16	30	37	90	41	40	110	173	238	33	17	12	12
17	31	38	110	40	40	130	149	230	32	16	12	14
18	32	40	135	38	40	144	134	207	34	14	12	21
19	33	43	185	37	39	156	125	170	32	15	11	23
20	33	46	201	36	39	214	124	131	28	15	12	18
21	33	49	207	35	38	365	132	127	29	15	11	16
22	32	52	187	34	38	517	134	119	29	16	10	15
23	31	52	153	33	38	651	126	103	29	16	9.6	14
24	32	52	138	32	38	823	114	89	26	16	9.0	13
25	31	50	118	31	38	792	104	77	27	16	9.2	13
26	31	45	110	30	38	714	95	68	30	15	8.7	12
27	31	40	100	29	38	663	87	60	30	15	8.6	12
28	31	40	90	28	38	630	79	55	29	14	10	12
29	31	43	80	27	---	645	76	49	27	14	9.7	12
30	31	40	75	26	---	582	72	46	24	14	9.3	12
31	30	---	70	27	---	568	---	43	---	13	9.1	---
TOTAL	972	1172	3053	1360	1047	8356	7689	3111	995	561	374.2	339.8
MEAN	31.4	39.1	98.5	43.9	37.4	270	256	100	33.2	18.1	12.1	11.3
MAX	37	52	207	66	40	823	606	238	42	27	19	23
MIN	27	29	45	26	28	38	72	43	24	13	8.6	6.2
CFSM	.19	.24	.60	.27	.23	1.66	1.57	.61	.20	.11	.07	.07
IN.	.22	.27	.70	.31	.24	1.91	1.75	.71	.23	.13	.09	.08

CAL YR 1977 TOTAL 26894.0 MEAN 73.7 MAX 476 MIN 14 CFSM .45 IN 6.14  
WTR YR 1978 TOTAL 29030.0 MEAN 79.5 MAX 823 MIN 6.2 CFSM .49 IN 6.63



04111500 DEER CREEK NEAR DANSVILLE, MI

LOCATION.--Lat 42°36'30", long 84°19'15", in E<sub>1</sub> sec.33, T.3 N., R.1 E., Ingham County, Hydrologic Unit 04050004, on right bank 15 ft (5 m) upstream from bridge on Clark Road, 3.5 mi (5.6 km) north of Dansville, and 7.2 mi (11.6 km) upstream from mouth.

DRAINAGE AREA.--16.3 mi<sup>2</sup> (42.2 km<sup>2</sup>).

PERIOD OF RECORD.--May 1954 to current year.

REVISED RECORDS.--WSP 1727: 1954(M).

GAGE.--Water-stage recorder and concrete control. Datum of gage is 889.08 ft (270.992 m) National Geodetic Vertical Datum of 1929 (levels by Michigan Department of Natural Resources).

REMARKS.--Records good except those for the winter period, which are fair. Several observations of water temperature were made during the year.

AVERAGE DISCHARGE.--24 years, 10.4 ft<sup>3</sup>/s (0.295 m<sup>3</sup>/s), 8.66 in/yr (220 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 962 ft<sup>3</sup>/s (27.2 m<sup>3</sup>/s) Apr. 19, 1975, gage height, 12.18 ft (3.712 m), from flood mark, rating curve extended above 610 ft<sup>3</sup>/s (17.3 m<sup>3</sup>/s); minimum, 0.04 ft<sup>3</sup>/s (0.001 m<sup>3</sup>/s) Sept. 8, 9, 12, 1978, gage height, 2.58 ft (0.786 m).

EXTREMES FOR CURRENT YEAR.--Peak discharges above base of 100 ft<sup>3</sup>/s (2.83 m<sup>3</sup>/s) and maximum (\*):

Date	Time	Discharge (ft <sup>3</sup> /s) (m <sup>3</sup> /s)	Gage height (ft) (m)	Date	Time	Discharge (ft <sup>3</sup> /s) (m <sup>3</sup> /s)	Gage height (ft) (m)
Mar. 21	2100	182 5.15	5.56 1.695	Mar. 29	0100	151 4.28	5.11 1.558
Mar. 23	2300	*209 5.92	*5.94 1.811	Mar. 31	2300	129 3.65	4.78 1.457
Mar. 26	2400	102 2.89	4.33 1.320				

Minimum discharge, 0.04 ft<sup>3</sup>/s (0.001 m<sup>3</sup>/s) Sept. 8, 9, 12, gage height, 2.58 ft (0.786 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2.2	1.6	14	5.4	2.8	3.5	105	6.2	3.5	1.4	.34	.18
2	3.0	1.7	15	5.0	2.9	4.0	50	5.9	3.2	1.8	.44	.16
3	2.4	1.6	10	4.8	2.9	4.2	37	5.5	3.0	1.8	1.6	.15
4	1.9	1.6	7.7	4.8	2.9	4.2	36	5.4	2.8	1.5	1.1	.11
5	1.6	1.6	6.6	4.8	2.9	4.2	34	5.8	2.8	1.3	.65	.12
6	1.5	1.7	5.7	5.0	2.9	4.0	37	5.8	2.5	1.2	.50	.09
7	1.4	1.8	4.8	5.2	2.9	3.5	43	5.4	2.4	1.1	.47	.06
8	1.5	2.0	3.9	5.6	2.9	3.5	29	5.6	3.0	1.0	.44	.06
9	1.8	2.0	4.0	4.8	2.9	3.5	25	6.0	2.8	.96	.44	.05
10	1.7	2.3	4.2	4.0	2.9	3.6	27	5.6	2.2	.93	.38	.12
11	1.6	2.5	4.5	3.5	3.0	3.7	26	5.4	2.0	.84	.37	.10
12	1.7	2.4	5.0	3.7	3.0	4.0	22	8.3	2.3	.78	.37	.33
13	1.6	2.2	5.7	3.9	3.0	4.5	18	12	2.5	.87	.33	.61
14	1.5	2.2	10	3.9	3.0	6.0	15	30	2.1	.93	.29	.63
15	1.5	2.3	14	3.7	3.0	8.0	14	26	1.9	.85	.25	.55
16	1.6	3.0	13	3.7	3.0	10	13	19	1.9	.74	.81	.63
17	1.7	3.6	14	3.1	3.0	12	12	16	2.0	.67	.62	2.4
18	1.7	3.5	33	2.9	3.0	15	11	13	1.8	.61	.38	5.0
19	1.7	3.3	41	3.3	3.0	24	12	10	1.6	.57	.56	2.9
20	1.6	4.1	31	3.4	3.0	40	14	11	1.5	.54	.44	1.4
21	1.6	6.2	27	3.2	3.0	146	15	21	1.9	.81	.32	1.4
22	1.5	5.3	20	3.3	3.0	163	13	15	1.6	.76	.28	1.2
23	1.6	4.7	16	2.9	3.0	168	12	12	1.4	.82	.24	.97
24	1.6	4.5	14	2.8	3.0	150	11	9.7	1.4	.82	.19	.88
25	1.6	4.4	13	2.6	3.1	73	9.7	8.2	1.4	.59	.19	.78
26	1.7	3.9	11	2.2	3.2	66	8.6	7.1	2.1	.54	.22	.77
27	1.6	3.4	9.1	.94	3.2	86	7.9	6.2	2.3	.50	.23	.74
28	1.6	3.5	8.3	.97	3.3	97	7.6	5.4	1.8	.43	.34	.82
29	1.6	3.3	7.5	1.3	---	111	6.9	4.8	1.5	.47	.29	.78
30	1.6	3.4	6.5	2.0	---	56	6.6	4.3	1.3	.41	.21	.77
31	1.6	---	5.8	2.5	---	88	---	3.9	---	.38	.20	---
TOTAL	52.8	89.5	385.3	109.21	83.7	1369.4	678.3	305.5	64.5	26.92	13.49	25.16
MEAN	1.70	2.98	12.4	3.52	2.99	44.2	22.6	9.85	2.15	.87	.44	.44
MAX	3.0	6.2	41	5.6	3.3	168	105	30	3.5	1.8	1.6	5.0
MIN	1.4	1.6	3.9	.94	2.8	3.5	6.6	3.9	1.3	.38	.19	.05
CFSM	.10	.18	.76	.22	.18	2.71	1.39	.60	.13	.05	.03	.05
IN.	.12	.20	.88	.25	.19	3.13	1.55	.70	.15	.06	.03	.06

CAL YR 1977 TOTAL 2114.89 MEAN 5.79 MAX 73 MIN .10 CFSM .36 IN 4.83  
WTR YR 1978 TOTAL 3203.78 MEAN 8.78 MAX 168 MIN .05 CFSM .54 IN 7.31

## STREAMS TRIBUTARY TO LAKE MICHIGAN

04112000 SLOAN CREEK NEAR WILLIAMSTON, MI

LOCATION.--Lat 42°40'33", long 84°21'50", in SE¼ NE¼ sec.1, T.3 N., R.1 W., Ingham County, Hydrologic Unit 04050004, on left bank 30 ft (9 m) downstream from bridge on Meridian Road, 2.1 mi (3.4 km) upstream from mouth, and 4.2 mi (6.8 km) west of Williamston.

DRAINAGE AREA.--9.34 mi<sup>2</sup> (24.19 km<sup>2</sup>).

PERIOD OF RECORD.--June 1954 to current year.

GAGE.--Water-stage recorder and concrete control with V-notch sharp-crested weir. Datum of gage is 862.12 ft (262.774 m) National Geodetic Vertical Datum of 1929 (levels by Michigan Department of Natural Resources).

REMARKS.--Records good except those for the winter period, which are fair. Several observations of water temperature were made during the year.

AVERAGE DISCHARGE.--24 years, 5.62 ft<sup>3</sup>/s (0.159 m<sup>3</sup>/s), 8.17 in/yr (208 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,290 ft<sup>3</sup>/s (36.5 m<sup>3</sup>/s) Apr. 18, 1975, gage height, 9.99 ft (3.045 m), from rating curve extended above 660 ft<sup>3</sup>/s (18.7 m<sup>3</sup>/s) on basis of computation of peak flow through culvert and over-road embankment; minimum, 0.01 ft<sup>3</sup>/s (<0.001 m<sup>3</sup>/s) Sept. 11, 1954, Jan. 18, 1957, gage height, 1.10 ft (0.335 m), caused by unusual regulation; minimum natural discharge, 0.02 ft<sup>3</sup>/s (0.001 m<sup>3</sup>/s) July 27, 1965, gage height, 1.18 ft (0.360 m).

EXTREMES FOR CURRENT YEAR.--Peak discharges above base of 120 ft<sup>3</sup>/s (3.40 m<sup>3</sup>/s) and maximum (\*):

Date	Time	Discharge (ft <sup>3</sup> /s) (m <sup>3</sup> /s)	Gage height (ft) (m)	Date	Time	Discharge (ft <sup>3</sup> /s) (m <sup>3</sup> /s)	Gage height (ft) (m)
Mar. 21	1800	152 4.30	3.98 1.213	Mar. 23	1800	*158 4.47	*4.02 1.225

Minimum discharge, 0.07 ft<sup>3</sup>/s (0.002 m<sup>3</sup>/s) Sept. 11, 12, gage height, 1.25 ft (0.381 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	.81	.41	5.0	2.3	1.1	1.2	59	2.9	1.5	.54	.18	.14
2	.90	.41	5.3	2.0	1.1	1.2	31	2.6	1.4	.75	.26	.13
3	.66	.43	3.5	1.9	1.1	1.2	27	2.4	1.3	.81	.72	.11
4	.57	.42	2.6	1.8	1.1	1.3	26	2.5	1.2	.66	.32	.11
5	.44	.40	2.1	1.8	1.1	1.3	23	3.1	1.3	.54	.23	.11
6	.40	.44	1.8	1.9	1.1	1.2	29	2.7	1.1	.50	.19	.11
7	.40	.46	1.4	2.0	1.1	1.1	28	2.7	1.2	.46	.18	.10
8	.46	.49	1.2	2.4	1.1	1.1	17	3.3	1.5	.42	.18	.11
9	.50	.50	1.1	2.1	1.1	1.2	13	3.5	1.3	.42	.21	.11
10	.46	.55	1.0	1.6	1.1	1.3	14	3.0	1.0	.38	.18	.12
11	.46	.53	.97	1.4	1.1	1.3	13	2.8	.92	.36	.17	.08
12	.49	.49	1.1	1.3	1.1	1.5	10	3.6	1.2	.36	.17	.13
13	.47	.46	1.3	1.5	1.1	1.8	8.5	5.7	1.1	.36	.16	.21
14	.45	.45	2.3	1.5	1.1	2.5	7.1	15	.90	.38	.14	.23
15	.44	.51	3.6	1.5	1.1	4.0	6.0	12	.85	.32	.13	.21
16	.52	.68	4.2	1.4	1.0	7.0	5.8	8.9	.85	.30	.48	.19
17	.50	.71	5.4	1.3	1.0	12	5.3	6.9	.85	.28	.26	.50
18	.47	.63	19	1.3	1.0	18	5.1	5.8	.80	.24	.19	.63
19	.47	.58	24	1.3	1.0	20	5.1	5.0	.50	.24	.60	.69
20	.46	.93	19	1.3	1.0	41	5.1	5.0	.57	.24	.46	.40
21	.44	1.3	15	1.3	1.0	123	5.0	5.8	.84	.32	.28	.36
22	.42	1.0	8.8	1.2	1.1	103	4.5	5.1	.75	.30	.21	.40
23	.41	.94	6.9	1.2	1.1	109	4.2	4.4	.69	.26	.17	.32
24	.41	.91	5.9	1.1	1.2	78	4.1	4.0	.66	.24	.16	.28
25	.41	.88	5.9	.90	1.2	46	3.8	3.6	.75	.21	.16	.24
26	.41	.84	4.9	.63	1.2	48	3.6	3.2	1.2	.21	.18	.23
27	.41	.72	4.2	.57	1.2	52	3.4	2.8	1.0	.26	.19	.21
28	.40	.74	3.3	.65	1.2	67	3.3	2.5	.75	.19	.23	.23
29	.39	.72	3.0	.78	---	57	3.1	2.2	.60	.19	.19	.21
30	.41	.74	2.7	.86	---	39	3.0	1.9	.54	.18	.17	.23
31	.39	---	2.5	.98	---	65	---	1.7	---	.17	.16	---
TOTAL	14.83	19.27	168.97	43.77	30.7	908.2	376.0	136.6	29.12	11.09	7.51	7.13
MEAN	.48	.64	5.45	1.41	1.10	29.3	12.5	4.41	.97	.36	.24	.24
MAX	.90	1.3	24	2.4	1.2	123	59	15	1.5	.81	.72	.69
MIN	.39	.40	.97	.57	1.0	1.1	3.0	1.7	.50	.17	.13	.08
CFSM	.05	.07	.58	.15	.12	3.14	1.34	.47	.10	.04	.03	.03
IN.	.06	.08	.67	.17	.12	3.62	1.50	.54	.12	.04	.03	.03

CAL YR 1977 TOTAL 991.40 MEAN 2.72 MAX 44 MIN .05 CFSM .29 IN 3.95  
WTR YR 1978 TOTAL 1753.19 MEAN 4.80 MAX 123 MIN .08 CFSM .51 IN 6.98

## STREAMS TRIBUTARY TO LAKE MICHIGAN

193

## 04112500 RED CEDAR RIVER AT EAST LANSING, MI

LOCATION.--Lat 42°43'40", long 84°28'40", in SW¼ sec.18, T.4 N., R.1 W., Ingham County, Hydrologic Unit 04050004, in left downstream bridge abutment of Farm Lane Bridge on Michigan State University Campus in East Lansing, 4.0 mi (6.4 km) upstream from Sycamore Creek, and 5.6 mi (9.0 km) upstream from mouth.

DRAINAGE AREA.--355 mi<sup>2</sup> (919 km<sup>2</sup>).

PERIOD OF RECORD.--August 1902 to December 1903, March 1931 to current year. Monthly discharge only for some periods, published in WSP 1307. Published as Red Cedar River at Agricultural College, August 1902 to December 1903 and as Cedar River at East Lansing, March 1931 to September 1965. Gage height records collected in this vicinity 1911-19, and for flood seasons only 1920-28, are contained in reports of U.S. Weather Bureau.

REVISED RECORDS.--WSP 1307: 1936(M).

GAGE.--Water-stage recorder and concrete control. Datum of gage is 824.39 ft (251.274 m) National Geodetic Vertical Datum of 1929. August 1902 to December 1903 nonrecording gage at site 0.8 mi (1.3 km) downstream at different datum. March 1931 to November 1940 water-stage recorder at site 250 ft (76 m) upstream at present datum.

REMARKS.--Records good. Occasional regulation at low flow by mill at Williamston, 16 mi (26 km) above station. Several observations of water temperature were made during the year. National Weather Service gage-height telemark at station.

AVERAGE DISCHARGE.--48 years, 205 ft<sup>3</sup>/s (5,806 m<sup>3</sup>/s), 7.84 in/yr (199 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 5,940 ft<sup>3</sup>/s (168 m<sup>3</sup>/s) Apr. 20, 1975, gage height, 11.95 ft (3.642 m); minimum, 3 ft<sup>3</sup>/s (0.08 m<sup>3</sup>/s) July 31, 1931.

EXTREMES OUTSIDE PERIOD OF RECORD.--Flood of Mar. 24, 1904, reached a stage of 13.4 ft (4.08 m), discharge, 8,000 ft<sup>3</sup>/s (277 m<sup>3</sup>/s).

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 1,650 ft<sup>3</sup>/s (46.7 m<sup>3</sup>/s) Mar. 24, gage height, 6.60 ft (2.012 m); minimum, 14 ft<sup>3</sup>/s (0.40 m<sup>3</sup>/s) Sept. 10, 11, 12, gage height, 3.06 ft (0.933 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	55	44	97	117	51	67	1080	149	89	42	20	18
2	57	44	152	108	53	67	1130	138	82	42	26	18
3	60	44	191	102	55	67	980	132	79	44	31	18
4	57	47	188	100	56	67	840	129	74	44	31	18
5	53	49	156	97	58	67	760	132	69	44	32	17
6	51	51	111	97	62	68	705	132	67	38	31	16
7	47	51	79	97	64	68	710	132	65	36	28	16
8	51	53	77	100	66	69	705	132	77	34	24	15
9	49	53	69	102	67	70	630	135	72	32	31	15
10	44	57	79	87	68	71	580	142	74	32	26	14
11	47	60	82	87	69	74	570	146	72	31	23	14
12	53	60	82	82	70	77	540	166	72	28	21	23
13	53	60	82	74	70	82	471	212	74	26	20	32
14	49	57	84	74	70	97	427	319	69	26	20	31
15	49	57	100	74	69	126	375	419	65	26	18	31
16	49	62	132	74	68	180	339	419	62	28	31	31
17	47	67	166	74	67	247	307	387	60	26	26	47
18	44	69	222	74	67	287	275	363	55	24	23	74
19	47	69	319	74	67	315	261	323	55	21	34	79
20	44	79	371	74	66	367	268	279	55	23	29	67
21	42	84	383	72	66	605	268	272	55	26	24	62
22	44	92	355	69	65	945	258	268	51	26	21	53
23	47	92	295	69	64	1280	247	247	47	28	20	44
24	47	87	264	69	64	1630	233	226	47	24	20	38
25	47	87	230	69	65	1590	222	208	44	23	21	36
26	42	84	102	62	66	1370	212	184	65	28	21	34
27	40	65	146	53	67	1210	194	156	57	26	28	34
28	40	67	174	49	67	1130	184	135	55	23	26	34
29	40	79	160	47	---	1140	170	117	47	21	23	34
30	42	69	138	47	---	1170	163	100	42	20	21	34
31	44	---	126	49	---	1080	---	95	---	20	20	---
TOTAL	1481	1939	5212	2423	1807	15683	14104	6394	1897	912	770	997
MEAN	47.8	64.6	168	78.2	64.5	506	470	206	63.2	29.4	24.8	33.2
MAX	60	92	383	117	70	1630	1130	419	89	44	34	79
MIN	40	44	69	47	51	67	163	95	42	20	18	14
CFSM	.14	.18	.47	.22	.18	1.43	1.32	.58	.18	.08	.07	.09
IN.	.16	.20	.55	.25	.19	1.64	1.48	.67	.20	.10	.08	.10
CAL YR 1977	TOTAL	45151	MEAN 124	MAX 780	MIN 18	CFSM .35	IN 4.73					
WTR YR 1978	TOTAL	53619	MEAN 147	MAX 1630	MIN 14	CFSM .41	IN 5.62					

## STREAMS TRIBUTARY TO LAKE MICHIGAN

04112850 SYCAMORE CREEK NEAR HOLT, MI

LOCATION.--Lat 42°38'25", long 84°28'58", in SW $\frac{1}{4}$  SW $\frac{1}{4}$  sec.18, T.3 N., R.1 W., Ingham County, Hydrologic Unit 04050004, on left bank 15 ft (5 m) downstream from bridge on Holt Road, and 1.5 mi (2.4 km) east of Holt.

DRAINAGE AREA.--80.6 mi<sup>2</sup> (208.8 km<sup>2</sup>).

PERIOD OF RECORD.--April 1975 to current year.

GAGE.--Water-stage recorder. Altitude of gage is 850 ft (259 m) from topographic map (nearest 10 ft).

REMARKS.--Records good except those for the winter period, which are fair. Several observations of water temperature were made during the year.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 2,110 ft<sup>3</sup>/s (59.8 m<sup>3</sup>/s) Apr. 19, 1975, gage height, 10.00 ft (3.048 m); minimum, 4.3 ft<sup>3</sup>/s (0.12 m<sup>3</sup>/s) Sept. 12, 1978, gage height, 1.58 ft (0.482 m).

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 499 ft<sup>3</sup>/s (14.1 m<sup>3</sup>/s) Mar. 24, gage height, 6.98 ft (2.128 m); minimum, 4.3 ft<sup>3</sup>/s (0.12 m<sup>3</sup>/s) Sept. 12, gage height, 1.58 ft (0.482 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	15	11	35	28	13	23	376	36	20	13	9.1	5.7
2	17	11	57	27	14	23	332	35	19	15	9.2	5.4
3	13	11	45	26	15	23	272	35	18	16	21	5.1
4	12	11	32	25	16	23	242	35	17	14	14	5.0
5	11	11	27	25	17	23	218	36	18	13	9.2	5.1
6	10	11	23	25	17	23	200	37	17	12	8.2	5.2
7	10	13	22	25	18	23	216	34	17	11	7.6	5.0
8	12	13	16	24	18	23	188	34	22	11	7.6	4.9
9	13	13	19	24	19	23	154	38	20	11	7.9	4.8
10	12	14	16	23	19	23	149	34	18	10	7.7	4.8
11	12	14	17	22	19	24	139	33	16	9.8	7.1	4.8
12	13	13	18	21	20	24	123	48	18	9.8	7.1	12
13	12	12	20	20	20	24	103	58	22	10	6.5	17
14	12	11	28	19	21	26	89	81	18	11	6.1	17
15	12	12	39	19	21	29	74	86	17	11	6.3	13
16	13	15	43	19	21	36	69	72	16	10	8.9	14
17	13	16	44	19	22	47	65	59	17	9.5	8.8	27
18	12	16	71	18	22	60	61	56	16	9.5	7.3	49
19	13	15	134	18	22	75	68	47	15	9.4	10	28
20	13	18	146	18	22	112	80	42	14	9.2	9.8	20
21	12	24	128	18	23	280	106	68	17	12	7.6	17
22	13	20	102	18	23	457	93	57	15	11	7.0	16
23	13	18	74	17	23	472	77	47	14	10	6.4	14
24	12	17	61	17	23	478	68	40	13	10	6.1	13
25	12	16	54	16	23	385	59	35	13	9.8	6.1	12
26	12	16	48	15	23	324	55	32	20	9.5	6.1	12
27	12	14	42	13	23	328	50	27	23	11	6.1	11
28	12	14	36	11	23	336	47	26	17	9.4	8.5	11
29	12	14	33	10	---	391	43	24	14	9.8	7.3	11
30	12	14	31	9.4	---	342	40	22	13	9.7	6.4	11
31	11	---	29	9.4	---	322	---	21	---	8.9	5.9	---
TOTAL	383	428	1492	598.8	560	4802	3856	1335	514	336.3	252.9	380.8
MEAN	12.4	14.3	48.1	19.3	20.0	155	129	43.1	17.1	10.8	8.16	12.7
MAX	17	24	146	28	23	478	376	86	23	16	21	49
MIN	10	11	16	9.4	13	23	40	21	13	8.9	5.9	4.8
CFSM	.15	.18	.60	.24	.25	1.92	1.60	.54	.21	.13	.10	.16
IN.	.18	.20	.69	.28	.26	2.22	1.78	.62	.24	.16	.12	.18
CAL YR 1977	TOTAL	10877.8	MEAN	29.8	MAX	260	MIN	5.3	CFSM	.37	IN	5.02
WTR YR 1978	TOTAL	14938.8	MEAN	40.9	MAX	478	MIN	4.8	CFSM	.51	IN	6.89

## STREAMS TRIBUTARY TO LAKE MICHIGAN

195

## 04113000 GRAND RIVER AT LANSING, MI

LOCATION.--Lat 42°45'02", long 84°33'19", in NW¼ sec.9, T.4 N., R.2 W., Ingham County, Hydrologic Unit 04050004, on right bank 30 ft (9 m) upstream from bridge on North Grand River Avenue in Lansing, 2.0 mi (3.2 km) downstream from Red Cedar River, and at mile 152 (245 km).

DRAINAGE AREA.--1,230 mi<sup>2</sup> (3,180 km<sup>2</sup>), approximately.

PERIOD OF RECORD.--March 1901 to September 1906, October 1934 to current year. Monthly discharge only for some periods, published in WSP 1307. Published as "at North Lansing" 1901-6. Gage-height records collected in this vicinity 1907-10 (flood seasons only), 1911-19, 1920-28 (flood seasons only), and since 1931 are contained in reports of U.S. Weather Bureau.

REVISED RECORDS.--WSP 1174: 1949. WSP 1387: 1901, 1903-4, 1935, 1937, 1942.

GAGE.--Water-stage recorder. Datum of gage is 805.53 ft (245.526 m) National Geodetic Vertical Datum of 1929 (levels by Michigan Department of Natural Resources). Prior to August 1906, nonrecording gage at same site at different datum. November 1934 to June 1949 water-stage recorder at site 1.8 mi (2.9 km) downstream at datum 2.42 ft (0.738 m) lower.

REMARKS.--Records good. Large diurnal fluctuation at medium and low flows caused by powerplants above station. Several observations of water temperature were made during the year. National Weather Service gage-height telemark at station.

AVERAGE DISCHARGE.--49 years, 827 ft<sup>3</sup>/s (23.42 m<sup>3</sup>/s), 9.13 in/yr (232 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 24,500 ft<sup>3</sup>/s (694 m<sup>3</sup>/s) Mar. 26, 1904, gage height, 18.60 ft (5.669 m), datum then in use, from rating curve extended above 15,000 ft<sup>3</sup>/s (425 m<sup>3</sup>/s); minimum, 2.8 ft<sup>3</sup>/s (0.079 m<sup>3</sup>/s) Sept. 9, 1963, gage height, 0.85 ft (0.259 m); minimum daily, 20 ft<sup>3</sup>/s (0.57 m<sup>3</sup>/s) Aug. 25, 1941.

EXTREMES OUTSIDE PERIOD OF RECORD.--Maximum discharge since at least 1901, that of Mar. 26, 1904.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 4,670 ft<sup>3</sup>/s (132 m<sup>3</sup>/s) Mar. 24, gage height, 9.34 ft (2.847 m); minimum, 34 ft<sup>3</sup>/s (0.963 m<sup>3</sup>/s) Sept. 19, gage height, 1.50 ft (0.457 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	415	322	635	890	308	417	3920	1000	606	368	248	122
2	423	225	658	777	401	394	3870	921	480	332	190	180
3	309	299	807	682	402	422	3650	720	435	336	328	124
4	425	273	694	696	422	426	3260	806	426	340	156	106
5	361	220	644	538	417	399	3020	803	430	350	319	107
6	328	364	523	588	448	404	2810	714	345	386	218	112
7	248	347	411	646	393	417	2930	689	386	368	237	103
8	379	331	482	759	347	440	2900	748	435	296	195	110
9	288	278	304	646	404	462	2790	774	368	177	252	106
10	221	395	338	574	354	440	2590	620	417	286	172	86
11	366	281	411	430	408	440	2450	728	291	180	210	112
12	426	322	443	399	399	502	2350	793	399	215	191	175
13	168	338	443	498	404	516	2090	917	368	171	129	439
14	383	374	465	494	390	718	1990	1080	235	260	110	278
15	318	374	537	489	399	723	1770	1290	318	165	137	331
16	195	304	780	507	412	885	1710	1370	255	171	423	303
17	312	383	852	480	462	998	1500	1380	273	247	168	346
18	324	392	1150	408	444	1050	1470	1370	187	180	154	720
19	207	378	1430	453	448	1120	1440	1320	286	180	408	505
20	299	574	1530	390	394	1380	1500	1310	327	190	141	425
21	236	469	1560	453	399	2370	1510	1280	286	160	135	412
22	320	365	1490	399	390	2950	1460	1340	235	252	140	324
23	305	518	1240	363	381	3730	1570	1300	201	174	212	276
24	247	407	1360	426	376	4380	1440	1230	243	217	149	282
25	302	487	1180	426	381	4330	1350	1160	227	261	137	137
26	252	452	786	480	394	4020	1290	1020	340	254	190	244
27	225	334	674	354	426	3730	1220	1020	394	239	204	164
28	290	338	880	332	448	3510	1150	903	538	130	169	315
29	246	369	813	268	---	3810	1090	844	462	302	145	203
30	215	378	867	358	---	3850	1040	696	381	145	129	214
31	326	---	854	341	---	3680	---	692	---	112	199	---
TOTAL	9359	10891	25241	15544	11251	52913	63130	30838	10574	7444	6195	7341
MEAN	302	363	814	501	402	1707	2104	995	352	240	200	245
MAX	426	574	1560	890	462	4380	3920	1380	606	386	423	720
MIN	168	220	304	268	308	394	1040	620	187	112	110	86
CFSM	.25	.30	.66	.41	.33	1.39	1.71	.81	.29	.20	.16	.20
IN.	.28	.33	.76	.47	.34	1.60	1.91	.93	.32	.23	.19	.22

CAL YR 1977 TOTAL 203668 MEAN 558 MAX 2690 MIN 73 CFSM .45 IN 6.16  
WTR YR 1978 TOTAL 250731 MEAN 687 MAX 4380 MIN 86 CFSM .56 IN 7.58



## STREAMS TRIBUTARY TO LAKE MICHIGAN

04113097 CARRIER CREEK NEAR LANSING, MI

LOCATION.--Lat 42°45'20", long 84°39'10", in SE¼ SW¼ sec.3, T.4 N., R.3 W., Eaton County, Hydrologic Unit 04050004, on left bank 15 ft (5 m) downstream from bridge on Willow Highway, 0.4 mi (0.6 km) upstream from mouth, and 2.6 mi (4.2 km) west of Lansing.

DRAINAGE AREA.--12.1 mi<sup>2</sup> (31.3 km<sup>2</sup>).

PERIOD OF RECORD.--January 1975 to current year.

GAGE.--Water-stage recorder. Altitude of gage is 805 ft (245 m) from topographic map (nearest 5 ft).

REMARKS.--Records fair except those for the winter period, which are poor. Several observations of water temperature were made during the year.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 532 ft<sup>3</sup>/s (15.1 m<sup>3</sup>/s) Apr. 19, 1975, gage height, 6.76 ft (2.060 m); no flow on many days during June, July, August, and September 1977.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 94 ft<sup>3</sup>/s (2.66 m<sup>3</sup>/s) Mar. 23, gage height, 3.20 ft (0.975 m), only peak above base of 80 ft<sup>3</sup>/s (2.27 m<sup>3</sup>/s); minimum, .01 ft<sup>3</sup>/s (<0.001 m<sup>3</sup>/s) Sept. 11, gage height, 0.43 ft (0.131 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	4.1	.28	9.5	1.2	.79	1.2	46	2.5	.73	1.1	.26	.11
2	1.4	.20	4.1	1.2	.80	1.3	27	2.3	.64	2.3	2.1	.09
3	.53	.19	2.2	1.1	.81	1.3	25	2.2	.50	.97	3.4	.10
4	.32	.21	1.5	1.1	.83	1.2	22	2.1	.42	.74	.44	.09
5	.26	.17	1.1	1.0	.85	1.1	19	2.5	.86	.49	.25	.06
6	.24	.54	.85	1.0	.87	1.1	22	2.1	.38	.41	.21	.05
7	.23	.38	.74	1.0	.88	1.1	22	1.9	.56	.39	.16	.04
8	.28	.27	.64	1.1	.90	1.0	16	2.4	4.5	.58	.17	.03
9	.37	.23	.39	1.1	.90	1.0	17	2.5	.80	.31	2.8	.03
10	.27	1.7	.45	1.2	.90	1.1	16	1.9	.53	.31	.50	.03
11	.26	.34	.55	1.1	.90	1.2	17	3.8	.37	.31	.24	.02
12	.28	.26	.70	1.1	.90	1.2	14	6.9	2.5	.28	.23	2.1
13	.26	.22	.87	1.1	.90	1.4	11	13	.57	.37	.13	8.0
14	.24	.23	1.1	1.0	.90	1.7	9.4	16	.41	.36	.10	1.5
15	.24	1.1	1.7	1.0	.90	2.3	8.0	10	.34	.33	.06	.38
16	.24	.49	2.3	.96	.90	3.1	7.1	7.8	.50	.26	12	1.4
17	.25	.29	2.7	.92	.90	4.4	6.1	6.1	.38	.25	1.7	5.3
18	.28	.56	19	.86	.90	6.6	7.6	5.0	.34	.27	.44	10
19	.43	.27	13	.82	.90	12	7.5	4.0	.33	.26	5.8	5.6
20	.29	4.7	10	.78	.90	22	11	9.2	.74	.36	.94	1.9
21	.26	1.9	8.0	.76	.90	76	8.2	9.0	2.5	2.0	.27	3.3
22	.26	.68	6.6	.75	.90	73	6.2	5.3	.29	.54	.23	.64
23	.23	.75	5.6	.75	.90	73	5.7	4.2	.24	4.0	.16	.33
24	.21	.77	4.8	.75	.91	65	5.3	3.5	.27	.60	.13	.28
25	.21	1.0	4.2	.72	.94	33	4.7	3.0	1.6	.44	.13	.24
26	.21	.74	3.7	.60	.96	28	4.0	2.5	9.0	.43	.11	.22
27	.22	.33	3.1	.45	1.0	27	3.7	2.0	3.4	1.3	1.6	1.1
28	.19	.27	2.6	.47	1.1	38	3.4	1.6	1.6	.42	4.4	.47
29	.17	.32	2.2	.55	---	41	3.1	1.2	.89	.38	.25	.19
30	.16	.30	1.8	.66	---	27	2.7	1.1	.72	.35	.13	.18
31	.16	---	1.5	.74	---	43	---	.94	---	.28	.10	---
TOTAL	13.05	19.69	117.49	27.84	25.14	591.3	377.7	138.54	36.91	21.39	39.44	43.78
MEAN	.42	.66	3.79	.90	.90	19.1	12.6	4.47	1.23	.69	1.27	1.46
MAX	4.1	4.7	19	1.2	1.1	76	46	16	9.0	4.0	12	10
MIN	.16	.17	.39	.45	.79	1.0	2.7	.94	.24	.25	.06	.02
CFSM	.04	.06	.31	.07	.07	1.58	1.04	.37	.10	.06	.11	.12
IN.	.04	.06	.36	.09	.08	1.82	1.16	.43	.11	.07	.12	.13

CAL YR 1977 TOTAL 804.04 MEAN 2.20 MAX 38 MIN .00 CFSM .18 IN 2.47  
WTR YR 1978 TOTAL 1452.27 MEAN 3.98 MAX 76 MIN .02 CFSM .33 IN 4.46

## STREAMS TRIBUTARY TO LAKE MICHIGAN

197

## 04114000 GRAND RIVER AT PORTLAND, MI

LOCATION.--Lat 42°51'20", long 84°54'45", in NW¼ sec.4, T.5 N., R.5 W., Ionia County, Hydrologic Unit 04050004, on left bank at downstream side of bridge on Kent Street, 1.0 mi (1.6 km) south of Portland, 1.9 mi (3.1 km) upstream from Looking Glass River, and at mile 115 (185 km).

DRAINAGE AREA.--1,385 mi<sup>2</sup> (3,587 km<sup>2</sup>).

PERIOD OF RECORD.--August 1952 to current year. Gage-height records for flood seasons collected in this vicinity 1907-28 are contained in reports of U.S. Weather Bureau.

GAGE.--Water-stage recorder. Datum of gage is 705.00 ft (214.884 m) National Geodetic Vertical Datum of 1929 (levels by Michigan Department of Natural Resources). Prior to July 6, 1953, nonrecording gage at same site and datum.

REMARKS.--Records good except those for the winter period, which are fair. Slight diurnal fluctuation caused by powerplants above station. Several observations of water temperature were made during the year. National Weather Service gage-height telemark at station.

AVERAGE DISCHARGE.--26 years, 908 ft<sup>3</sup>/s (25.71 m<sup>3</sup>/s), 8.90 in/yr (226 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 12,400 ft<sup>3</sup>/s (351 m<sup>3</sup>/s) Apr. 21, 1975, gage height, 12.98 ft (3.956 m); minimum, 38 ft<sup>3</sup>/s (1.08 m<sup>3</sup>/s) Oct. 10, 1963; minimum daily, 58 ft<sup>3</sup>/s (1.64 m<sup>3</sup>/s) Oct. 9, 1963.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 5,210 ft<sup>3</sup>/s (148 m<sup>3</sup>/s) Mar. 25, gage height, 9.68 ft (2.950 m); minimum daily, 140 ft<sup>3</sup>/s (3.96 m<sup>3</sup>/s) Sept. 6.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	343	332	478	970	350	500	4730	1060	706	501	179	188
2	538	368	758	1000	350	470	4530	1040	621	474	252	207
3	509	267	766	850	450	450	4370	923	517	433	304	175
4	409	365	826	760	450	470	3880	750	481	413	371	201
5	505	279	707	760	470	470	3510	853	477	410	220	146
6	443	272	697	600	470	450	3380	857	486	417	299	140
7	415	378	573	660	500	450	3420	747	419	449	246	166
8	336	379	478	740	450	470	3360	749	499	455	303	152
9	473	383	450	850	400	500	3210	804	523	374	214	146
10	387	312	350	560	450	500	3070	816	428	262	307	158
11	289	433	400	600	400	490	3010	664	473	374	268	141
12	451	320	450	500	450	489	2760	908	388	258	194	163
13	497	351	500	450	450	550	2580	969	493	282	263	270
14	297	356	500	560	450	605	2270	1280	469	298	176	211
15	410	397	600	530	450	847	2180	1410	329	291	155	354
16	392	416	682	500	450	850	1870	1470	420	237	207	350
17	305	337	810	560	450	1020	1830	1540	348	268	470	379
18	353	411	1020	520	500	1110	1620	1520	405	227	262	449
19	371	411	1500	450	500	1170	1620	1470	283	305	230	357
20	282	425	1730	500	500	1340	1610	1400	386	209	430	545
21	381	641	1840	450	450	2470	1660	1460	430	258	231	531
22	273	516	1660	500	450	3310	1660	1380	426	283	184	514
23	380	428	1460	450	450	4100	1580	1400	299	300	184	400
24	359	560	1310	400	440	4870	1660	1330	319	232	214	354
25	303	465	1340	480	430	5000	1500	1230	380	272	236	356
26	351	520	953	480	430	4600	1410	1140	423	295	187	238
27	308	479	880	540	450	4330	1350	1050	783	250	193	271
28	286	382	750	400	480	4110	1250	975	567	337	284	291
29	362	392	1000	350	---	4510	1180	891	650	200	261	350
30	265	408	900	300	---	4430	1120	827	560	243	193	284
31	296	---	970	400	---	4490	---	729	---	246	184	---
TOTAL	11569	11983	27338	17670	12520	59421	73180	33642	13988	9853	7701	9337
MEAN	373	399	882	570	447	1917	2439	1085	466	318	248	311
MAX	538	641	1840	1000	500	5000	4730	1540	783	501	470	557
MIN	265	267	350	300	350	450	1120	664	283	200	155	140
CFSM	.27	.29	.64	.41	.32	1.38	1.76	.78	.34	.23	.18	.23
IN.	.31	.32	.73	.47	.34	1.60	1.97	.90	.38	.26	.21	.25
CAL YR 1977	TOTAL	229887	MEAN 630	MAX	2880	MIN 110	CFSM .46	IN 6.17				
WTR YR 1978	TOTAL	288202	MEAN 790	MAX	5000	MIN 140	CFSM .57	IN 7.74				

## STREAMS TRIBUTARY TO LAKE MICHIGAN

04114500 LOOKING GLASS RIVER NEAR EAGLE, MI

LOCATION.--Lat 42°49'45", long 84°46'40", in sec.10, T.5 N., R.4 W., Clinton County, Hydrologic Unit 04050004, on right bank at upstream side of highway bridge, 1.5 mi (2.4 km) northeast of Eagle and 10 mi (16 km) upstream from mouth.

DRAINAGE AREA.--281 mi<sup>2</sup> (728 km<sup>2</sup>).

PERIOD OF RECORD.--August 1944 to current year.

REVISED RECORDS.--WSP 1387: 1946-47.

GAGE.--Water-stage recorder. Datum of gage is 747.09 ft (227.713 m) National Geodetic Vertical Datum of 1929 (levels by Michigan Department of Natural Resources). Prior to June 2, 1962, nonrecording gage at same site and datum.

REMARKS.--Records good except those for the winter period, which are fair. Small intermittent diversion at times into Lake Geneva when discharge is above 50 ft<sup>3</sup>/s (1.42 m<sup>3</sup>/s). Several observations of water temperature were made during the year.

AVERAGE DISCHARGE.--34 years, 173 ft<sup>3</sup>/s (4.899 m<sup>3</sup>/s), 8.36 in/yr (212 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 2,860 ft<sup>3</sup>/s (81.0 m<sup>3</sup>/s) Apr. 5, 1947, gage height, 7.70 ft (2.347 m), from graph based on gage readings, from rating curve extended above 1,900 ft<sup>3</sup>/s (53.8 m<sup>3</sup>/s); maximum gage height, 9.9 ft (3.02 m) Mar. 7, 1956 (backwater from ice), from high-water mark; minimum discharge, 10 ft<sup>3</sup>/s (0.28 m<sup>3</sup>/s) July 28, 1965, gage height, 1.01 ft (0.308 m).

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 1,250 ft<sup>3</sup>/s (35.4 m<sup>3</sup>/s) Apr. 1, gage height, 5.32 ft (1.622 m); minimum, 18 ft<sup>3</sup>/s (0.51 m<sup>3</sup>/s) Sept. 9, 10, gage height, 1.17 ft (0.357 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	60	37	87	90	43	60	1180	126	73	38	24	26
2	58	37	82	88	44	60	1020	118	67	39	28	25
3	53	39	82	85	47	60	950	113	63	39	40	23
4	51	38	83	82	50	60	910	107	60	39	31	22
5	48	39	70	80	52	60	845	106	59	39	33	22
6	47	40	66	78	54	60	873	104	56	38	31	21
7	45	41	64	77	55	60	865	103	55	36	29	20
8	46	41	62	76	57	60	799	105	59	36	28	19
9	47	41	60	74	58	60	738	108	57	34	28	19
10	45	45	60	72	59	60	697	105	56	33	28	19
11	46	46	62	70	60	62	665	110	54	31	26	19
12	48	46	62	67	60	64	597	133	55	30	25	23
13	47	46	64	65	60	66	538	149	54	30	25	31
14	45	46	65	61	61	74	489	170	50	30	23	39
15	45	46	68	60	62	90	448	175	50	29	22	35
16	45	47	80	59	62	120	412	179	50	28	34	32
17	44	46	100	58	62	170	379	185	51	27	34	35
18	43	47	130	57	62	220	353	193	49	27	29	56
19	43	48	148	57	62	250	331	199	46	26	35	76
20	42	59	160	56	62	300	316	212	44	26	34	63
21	43	62	153	56	62	350	293	214	44	28	30	64
22	41	60	130	55	61	399	263	198	43	28	30	55
23	40	62	160	54	61	464	239	179	42	27	28	48
24	39	67	150	53	61	508	221	162	40	27	26	43
25	39	67	130	52	60	417	202	147	40	26	25	39
26	37	60	100	50	60	428	184	133	63	26	24	36
27	36	54	120	45	60	478	168	119	52	26	25	34
28	35	50	140	40	60	664	154	106	47	24	31	33
29	34	52	130	40	---	858	144	95	42	23	28	32
30	35	70	120	38	---	826	135	87	39	24	26	31
31	37	---	100	40	---	1020	---	79	---	23	26	---
TOTAL	1364	1480	3088	1935	1617	8428	15408	4319	1560	937	887	1040
MEAN	44.0	49.3	99.6	62.4	57.8	272	514	139	52.0	30.2	28.6	34.7
MAX	60	70	160	90	62	1020	1180	214	73	39	40	76
MIN	34	37	60	38	43	60	135	79	39	23	22	19
CFSM	.16	.18	.35	.22	.21	.97	1.83	.50	.19	.11	.10	.12
IN.	.18	.20	.41	.26	.21	1.12	2.04	.57	.21	.12	.12	.14
CAL YR 1977	TOTAL	32856	MEAN	90.0	MAX	377	MIN	21	CFSM	.32	IN	4.35
WTR YR 1978	TOTAL	42063	MEAN	115	MAX	1180	MIN	19	CFSM	.41	IN	5.57

## STREAMS TRIBUTARY TO LAKE MICHIGAN

199

## 04115000 MAPLE RIVER AT MAPLE RAPIDS, MI

LOCATION.--Lat 43°06'35", long 84°41'35", in sec.5, T.8 N., R.3 W., Clinton County, Hydrologic Unit 04050005, on right bank at downstream side of bridge on Maple Road at Maple Rapids, 50 ft (15 m) upstream from Pine Creek, and 0.8 mi (1.3 km) upstream from Hayworth Creek. Records include flow of Pine Creek.

DRAINAGE AREA.--434 mi<sup>2</sup> (1,124 km<sup>2</sup>).

PERIOD OF RECORD.--August 1944 to current year.

REVISED RECORDS.--WSP 1707: 1956.

GAGE.--Water-stage recorder. Datum of gage is 642.58 ft (195.858 m) National Geodetic Vertical Datum of 1929 (levels by Michigan Department of Natural Resources). Prior to Oct. 4, 1968, nonrecording gage at same site and datum.

REMARKS.--Records fair except those for the winter period, which are poor. Several observations of water temperature were made during the year.

AVERAGE DISCHARGE.--34 years, 251 ft<sup>3</sup>/s (7.108 m<sup>3</sup>/s), 7.85 in/yr (199 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum daily discharge, 6,500 ft<sup>3</sup>/s (184 m<sup>3</sup>/s) Mar. 20, 1948; maximum gage height, 11 22 ft (3.420 m) Mar. 20, 1948, from floodmark (backwater from ice); minimum discharge, 4.4 ft<sup>3</sup>/s (0.12 m<sup>3</sup>/s) Aug. 13, 1965, gage height, 1.62 ft (0.494 m).

EXTREMES OUTSIDE PERIOD OF RECORD.--Flood in March 1904 reached a stage of 13.8 ft (4.21 m), from information by local resident.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 3,770 ft<sup>3</sup>/s (107 m<sup>3</sup>/s) Apr. 1, gage height, 9.44 ft (2.877 m); minimum, 7.5 ft<sup>3</sup>/s (0.21 m<sup>3</sup>/s) Sept. 11, gage height, 2.08 ft (0.634 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT
1	95	57	108	180	48	44	3610	187	98	30	13	15
2	159	57	158	160	50	62	3140	165	87	31	12	14
3	192	57	205	150	52	62	2740	154	79	31	11	13
4	197	58	235	140	54	62	2570	139	70	31	10	12
5	190	56	242	130	56	60	2390	127	64	30	11	12
6	178	55	200	120	58	60	2180	119	58	29	11	9.5
7	163	56	150	120	60	60	2090	117	55	27	11	8.9
8	156	56	120	110	62	60	1890	112	55	27	10	8.5
9	161	58	110	110	64	60	1640	103	53	25	11	9.9
10	165	63	110	100	66	60	1430	102	50	25	11	8.6
11	158	85	110	95	66	60	1300	99	47	24	11	8.2
12	156	91	120	90	68	60	1210	104	48	23	11	9.5
13	153	83	122	85	68	62	1090	125	48	22	11	9.6
14	145	77	118	80	68	66	977	169	46	21	11	9.9
15	140	77	117	75	68	70	851	270	44	20	11	11
16	132	85	120	75	68	80	735	450	44	19	11	14
17	122	88	133	70	68	90	646	400	43	18	12	16
18	116	94	196	68	66	100	578	350	45	17	12	17
19	110	93	326	65	66	120	524	300	45	16	17	20
20	101	105	458	62	66	160	492	250	43	15	24	21
21	95	104	500	60	66	257	461	230	40	15	29	32
22	89	125	520	58	66	397	427	216	38	15	28	49
23	83	121	500	57	66	634	395	206	37	15	25	51
24	77	116	450	55	66	1160	366	194	35	16	23	46
25	71	113	400	54	66	1610	339	182	33	17	21	42
26	67	109	350	52	66	1840	307	168	33	17	18	34
27	64	103	300	50	65	1930	280	155	34	16	17	31
28	63	99	270	50	64	2110	254	144	34	16	17	31
29	60	98	240	49	---	2600	233	131	33	15	17	30
30	58	100	220	48	---	2620	212	119	32	14	17	29
31	57	---	200	48	---	2750	---	109	---	14	16	---
TOTAL	3773	2539	7408	2666	1767	19386	35357	5696	1471	651	470	620.6
MEAN	122	84.6	239	86.0	63.1	625	1179	184	49.0	21.0	15.2	20.7
MAX	197	125	520	180	68	2750	3610	450	98	31	29	51
MIN	57	55	108	48	48	60	212	99	32	14	10	8.2
CFSM	.28	.20	.55	.20	.15	1.44	2.72	.42	.11	.05	.04	.05
IN.	.32	.22	.63	.23	.15	1.66	3.03	.49	.13	.06	.04	.05
CAL YR 1977	TOTAL	38983.8	MEAN 107	MAX 520	MIN 5.0	CFSM .25	IN 3.34					
WTR YR 1978	TOTAL	81804.6	MEAN 224	MAX 3610	MIN 8.2	CFSM .52	IN 7.01					

## STREAMS TRIBUTARY TO LAKE MICHIGAN

04116000 GRAND RIVER AT IONIA, MI

LOCATION.--Lat 42°58'20", long 85°04'13", in NW 1/4 sec.30, T.7 N., R.6 W., Ionia County, Hydrologic Unit 04050006, on left bank 15 ft (5 m) downstream from bridge on State Highway 66 at Ionia, 2.7 mi (4.3 km) downstream from Prairie Creek, and at mile 87 (140 km).

DRAINAGE AREA.--2,840 mi<sup>2</sup> (7,360 km<sup>2</sup>), approximately.

PERIOD OF RECORD.--March to June 1931, July and September 1931 (fragmentary), July 1951 to current year. Gage-height records for flood seasons collected in this vicinity 1907-28 are contained in reports of U.S. Weather Bureau.

GAGE.--Water-stage recorder. Datum of gage is 615.38 ft (187.568 m) National Geodetic Vertical Datum of 1929., Mar. 19 to Sept. 24, 1931, nonrecording gage at site 1.5 mi (2.4 km) upstream at different datum.

REMARKS.--Records good except those for the winter period, which are fair. Diurnal fluctuation below about 5,000 ft<sup>3</sup>/s (142 m<sup>3</sup>/s) caused by powerplants above station. Several observations of water temperature were made during the year. National Weather Service gage-height telemark at station.

AVERAGE DISCHARGE.--27 years (water years 1952-78), 1,868 ft<sup>3</sup>/s (52.90 m<sup>3</sup>/s), 8.93 in/yr (227 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 21,500 ft<sup>3</sup>/s (609 m<sup>3</sup>/s) Apr. 1, 1960, gage height, 23.43 ft (7.141 m); minimum, 40 ft<sup>3</sup>/s (1.13 m<sup>3</sup>/s) May 13, 1968, gage height, 5.61 ft (1.710 m); minimum daily, 109 ft<sup>3</sup>/s (3.09 m<sup>3</sup>/s) July 16, 1977.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 13,000 ft<sup>3</sup>/s (368 m<sup>3</sup>/s) Apr. 2, gage height, 20.45 ft (6.233 m); minimum, 160 ft<sup>3</sup>/s (4.53 m<sup>3</sup>/s) Aug. 15, gage height, 6.57 ft (2.002 m); minimum daily, 215 ft<sup>3</sup>/s (6.09 m<sup>3</sup>/s) Aug. 14.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1000	572	846	2000	600	1000	11600	1910	1000	738	452	366
2	900	570	1270	1700	650	1000	12800	1870	1600	739	315	345
3	852	673	1530	1500	750	1000	12100	1750	692	731	361	374
4	983	660	1350	1200	800	800	10800	1680	801	473	461	341
5	929	650	1450	1400	800	850	9670	1450	980	722	529	355
6	870	478	1290	1400	900	900	8880	1460	828	524	424	306
7	863	620	1240	1400	800	900	8720	1530	779	682	371	285
8	891	644	1100	1550	760	800	8460	1430	818	664	375	284
9	875	743	800	1650	740	900	7960	1320	853	657	400	285
10	875	654	540	1200	800	900	7350	1540	897	566	411	284
11	814	651	450	1000	900	1000	6960	1450	712	434	401	287
12	740	686	900	1000	800	1000	6590	1410	777	467	374	306
13	821	611	1200	900	800	1200	6080	1730	720	467	268	384
14	935	677	1100	500	800	1300	5450	2300	810	463	215	598
15	809	685	1050	600	800	1500	4780	2440	744	464	325	743
16	695	731	1050	1000	800	1500	4320	2400	656	411	324	549
17	772	732	1220	900	840	1600	3860	2560	706	409	319	652
18	723	682	1690	800	900	1800	3620	2720	709	407	599	671
19	658	717	2480	900	960	2200	3360	2330	708	407	422	978
20	706	792	2960	900	900	2480	3200	2430	649	406	450	1100
21	726	956	3110	800	900	2860	3210	2400	654	422	761	841
22	667	1180	3070	800	700	4700	3110	2330	669	417	852	927
23	598	897	2930	900	900	5820	2970	2240	692	391	829	800
24	641	795	2790	800	900	7160	2920	2190	593	523	885	649
25	672	977	2620	800	800	8300	2750	2070	533	445	906	644
26	630	903	2420	800	800	8670	2560	1950	1010	440	592	600
27	616	928	1200	900	800	8370	2420	1910	1420	442	459	507
28	644	926	1000	600	800	8180	2340	1550	1170	473	531	541
29	564	848	1200	550	---	9070	2180	1550	743	459	553	523
30	543	732	1600	600	---	10200	2110	1380	801	345	500	595
31	551	---	1750	600	---	10500	---	1410	---	346	409	---
TOTAL	23563	22370	49206	31650	22700	108460	173130	58690	24724	15534	15666	16180
MEAN	760	746	1587	1021	811	3499	5771	1893	824	501	505	539
MAX	1000	1180	3110	2000	960	10500	12800	2720	1600	739	906	1100
MIN	543	478	450	500	600	800	2110	1320	533	345	215	284
CFSM	.27	.26	.56	.36	.29	1.23	2.03	.67	.29	.18	.18	.19
IN.	.31	.29	.64	.41	.30	1.42	2.27	.77	.32	.20	.21	.21

CAL YR 1977 TOTAL 401087 MEAN 1099 MAX 4330 MIN 109 CFSM .39 IN 5.25  
WTR YR 1978 TOTAL 561873 MEAN 1539 MAX 12800 MIN 215 CFSM .54 IN 7.36



## STREAMS TRIBUTARY TO LAKE MICHIGAN

201

## 04116500 FLAT RIVER AT SMYRNA, MI

LOCATION.--Lat 43°03'10", long 85°15'50", in NW¼ sec.28, T.8 N., R.8 W., Ionia County, Hydrologic Unit 04050006, on right bank at downstream side of highway bridge, 600 ft (183 m) downstream from dam and inactive powerplant, and 0.5 mi (0.8 km) south of Smyrna.

DRAINAGE AREA.--528 mi<sup>2</sup> (1,368 km<sup>2</sup>).

PERIOD OF RECORD.--October 1950 to current year. Monthly discharge only for some periods, published in WSP 1727.

GAGE.--Water-stage recorder. Datum of gage is 729.53 ft (222.361 m) National Geodetic Vertical Datum of 1929 (levels by Michigan Department of Natural Resources).

REMARKS.--Records good except those for the winter period, which are fair. Diurnal fluctuation caused by powerplants above station prior to September 1956; occasional diurnal fluctuation since. Several observations of water temperature were made during the year.

AVERAGE DISCHARGE.--28 years, 433 ft<sup>3</sup>/s (12.26 m<sup>3</sup>/s), 11.14 in/yr (283 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 3,100 ft<sup>3</sup>/s (87.8 m<sup>3</sup>/s) Apr. 22, 1967, gage height, 7.27 ft (2.216 m), caused by momentary release of water from storage above station; maximum gage height, 8.26 ft (2.518 m) Feb. 6, 1974, backwater from ice; minimum discharge, 7.4 ft<sup>3</sup>/s (0.21 m<sup>3</sup>/s) Sept. 9, 1953; minimum daily, 70 ft<sup>3</sup>/s (1.98 m<sup>3</sup>/s) Sept. 6, 1964.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 1,720 ft<sup>3</sup>/s (48.7 m<sup>3</sup>/s) Apr. 7, gage height, 6.10 ft (1.859 m); maximum gage height, 8.19 ft (2.496 m) Dec. 28, backwater from ice; minimum discharge, 46 ft<sup>3</sup>/s (1.30 m<sup>3</sup>/s) Oct. 21, gage height, 2.76 ft (0.841 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	424	259	386	390	300	300	1020	401	279	251	170	244
2	438	267	403	380	300	300	1120	387	269	271	167	245
3	445	267	448	370	300	290	1310	374	257	278	193	235
4	432	282	441	370	300	290	1580	360	248	265	182	218
5	416	327	466	360	300	290	1450	357	246	247	170	219
6	389	317	518	360	300	290	1500	368	239	232	162	211
7	368	295	480	350	300	290	1620	372	240	224	159	202
8	401	239	395	340	300	290	1590	373	244	217	160	194
9	400	243	318	330	300	292	1550	379	240	206	198	190
10	400	320	288	330	300	302	1480	375	230	202	184	188
11	415	314	289	320	300	315	1410	370	219	194	173	189
12	419	298	290	320	300	335	1300	415	230	180	163	220
13	407	294	450	320	300	359	1200	523	241	179	149	202
14	391	293	396	320	300	412	1110	617	237	180	154	306
15	377	293	435	320	300	443	1010	666	225	176	148	379
16	358	286	425	320	300	446	904	660	225	169	192	391
17	346	333	413	320	300	437	855	637	235	153	180	387
18	336	262	498	320	300	415	792	603	299	158	180	403
19	324	340	563	320	300	427	760	555	335	156	288	395
20	312	356	626	320	300	452	725	511	334	155	503	400
21	204	294	614	320	300	510	677	485	304	166	540	404
22	244	385	680	320	300	550	607	468	282	210	539	375
23	242	394	713	320	300	594	583	441	261	220	458	347
24	256	415	680	310	300	639	573	406	247	210	393	318
25	313	401	600	310	300	639	558	373	241	200	354	299
26	266	331	500	310	299	654	529	355	346	195	325	282
27	289	378	450	310	316	662	504	338	342	190	312	279
28	275	383	440	310	300	702	478	316	312	185	317	280
29	237	393	430	310	---	774	450	308	281	180	321	244
30	235	329	420	300	---	807	418	266	259	180	299	246
31	243	---	410	300	---	868	---	289	---	175	270	---
TOTAL	10602	9588	14465	10200	8415	14374	29663	13348	7947	6204	8003	8432
MEAN	342	320	467	329	301	464	989	431	265	200	258	288
MAX	445	415	713	390	316	868	1620	666	346	278	540	404
MIN	204	239	288	300	299	290	418	266	219	153	148	188
CFSM	.65	.61	.88	.62	.57	.88	1.87	.82	.50	.38	.49	.55
IN.	.75	.68	1.02	.72	.59	1.01	2.09	.94	.56	.44	.56	.61
CAL YR 1977	TOTAL	122792	MEAN 336	MAX 1150	MIN 116	CFSM .64	IN 8.65					
WTR YR 1978	TOTAL	141441	MEAN 388	MAX 1620	MIN 148	CFSM .74	IN 9.97					

## STREAMS TRIBUTARY TO LAKE MICHIGAN

04117500 THORNAPPLE RIVER NEAR HASTINGS, MI

LOCATION.--Lat 42°36'57", long 85°14'11", in SE¼ sec.27, T.3 N., R.8 W., Barry County, Hydrologic Unit 04050007, on downstream side of highway bridge, 0.6 mi (1.0 km) downstream from Cedar Creek, 2.0 mi (3.2 km) downstream from Thornapple Lake, and 3.2 mi (5.1 km) southeast of Hastings.

DRAINAGE AREA.--385 mi<sup>2</sup> (997 km<sup>2</sup>).

PERIOD OF RECORD.--October 1944 to current year.

GAGE.--Water-stage recorder. Datum of gage is 786.71 ft (239.789 m) National Geodetic Vertical Datum of 1929 (Levels by Michigan Department of Natural Resources). Prior to Oct. 1, 1965, nonrecording gage at same site and datum.

REMARKS.--Records good. Several observations of water temperature were made during the year. National Weather Service gage-height telemark at station.

AVERAGE DISCHARGE.--34 years, 307 ft<sup>3</sup>/s (8.694 m<sup>3</sup>/s), 10.83 in/yr (275 mm/yr)..

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 6,810 ft<sup>3</sup>/s (193 m<sup>3</sup>/s) Apr. 7, 1947, gage height, 10.20 ft (3.109 m), from graph based on gage readings; minimum, 33 ft<sup>3</sup>/s (0.93 m<sup>3</sup>/s) Aug. 10, 1964, gage height, 2.71 ft (0.826 m).

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 1,920 ft<sup>3</sup>/s (54.4 m<sup>3</sup>/s) Mar. 26, gage height, 6.45 ft (1.966 m); minimum 73 ft<sup>3</sup>/s (2.07 m<sup>3</sup>/s) Sept. 11, 12, gage height, 2.86 ft (0.872 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	163	127	156	245	150	150	1510	207	161	430	93	46
2	172	132	215	223	155	150	1580	197	150	365	89	90
3	176	135	293	213	160	140	1550	191	141	341	89	87
4	165	137	307	215	160	140	1440	190	136	309	87	83
5	153	134	281	212	160	140	1320	185	137	265	86	81
6	143	129	247	212	160	140	1220	185	132	228	86	79
7	134	123	219	207	160	140	1230	185	129	201	83	77
8	136	128	186	217	160	140	1260	188	131	189	81	76
9	144	129	147	210	160	140	1190	190	135	173	87	75
10	146	131	158	200	160	144	1110	193	136	158	95	75
11	143	137	169	197	162	154	1060	194	129	145	94	74
12	145	140	166	191	157	167	1010	234	127	132	92	95
13	143	134	168	181	157	181	919	334	128	125	87	170
14	137	129	182	172	157	204	820	470	125	123	84	256
15	134	128	204	170	156	261	712	587	121	117	81	271
16	130	131	222	160	157	322	610	634	119	114	102	265
17	125	134	243	155	159	369	527	605	121	109	128	308
18	122	137	324	150	160	386	461	539	123	103	128	492
19	123	143	514	149	160	402	419	474	121	102	123	512
20	123	143	689	149	159	438	400	423	115	110	119	524
21	124	166	766	149	173	584	390	417	114	115	112	591
22	123	183	754	151	160	857	366	408	113	120	105	526
23	123	190	708	154	150	1200	340	373	109	127	98	441
24	122	180	650	147	141	1570	319	328	104	131	93	361
25	122	176	557	145	143	1810	301	288	100	122	91	290
26	123	170	413	145	147	1880	282	257	222	117	88	240
27	124	155	341	140	149	1700	262	231	502	113	89	207
28	125	151	305	140	149	1480	243	210	670	109	100	193
29	126	152	297	142	---	1410	231	192	663	101	109	179
30	130	143	290	141	---	1440	221	179	558	98	108	166
31	130	---	266	145	---	1460	---	172	---	95	102	---
TOTAL	4229	4342	10447	5427	4381	19699	23303	9460	5772	5087	3009	7180
MEAN	136	145	337	175	156	635	777	305	192	164	97.1	239
MAX	176	190	766	245	173	1880	1580	634	670	430	128	524
MIN	122	127	147	140	141	140	221	172	100	95	81	74
CFSM	.35	.38	.48	.46	.41	1.65	2.02	.79	.50	.43	.25	.62
IN.	.41	.42	1.01	.52	.42	1.90	2.25	.91	.56	.49	.29	.69

CAL YR 1977 TOTAL 75149 MEAN 206 MAX 777 MIN 66 CFSM .54 IN 7.26  
WTR YR 1978 TOTAL 102336 MEAN 280 MAX 1880 MIN 74 CFSM .73 IN 9.89

## 04118000 THORNAPPLE RIVER NEAR CALEDONIA, MI

LOCATION.--Lat 42°48'40", long 85°29'00", in NW¼ sec.22, T.5 N., R.10 W., Kent County, Hydrologic Unit 04050007, on right bank 200 ft (61 m) downstream from LaBarge powerplant, 2.3 mi (3.7 km) northeast of Caledonia, and 3.3 mi (5.3 km) downstream from Coldwater River.

DRAINAGE AREA.--773 mi<sup>2</sup> (2,002 km<sup>2</sup>).

PERIOD OF RECORD.--October 1930 to September 1938, October 1951 to current year. Monthly discharge only for some periods, published in WSP 1307.

REVISED RECORDS.--WSP 824: 1931-36. WSP 1307: 1931-37.

GAGE.--Water-stage recorder. Datum of gage is 676.31 ft (206.139 m) Consumers Power Co. datum. Oct. 1, 1930 to Sept. 30, 1938, non-recording gage at same site and at National Geodetic Vertical Datum of 1929.

REMARKS.--Records good except those for the winter period, which are fair. Prior to Dec. 1, 1958, large diurnal fluctuation at low and medium flow caused by powerplant above station; occasional fluctuation since. Several observations of water temperature were made during the year.

AVERAGE DISCHARGE.--35 years, 566 ft<sup>3</sup>/s (16.3 m<sup>3</sup>/s), 9.94 in/yr (252 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 6,290 ft<sup>3</sup>/s (178 m<sup>3</sup>/s) May 10, 1956, gage height, 10.79 ft (3.289 m); maximum gage height, 10.96 ft (3.341 m) Apr. 22, 1975; minimum discharge, 1.0 ft<sup>3</sup>/s (0.028 m<sup>3</sup>/s) May 28, 1968, gage height, 1.40 ft (0.427 m), result of regulation during bridge construction.

EXTREMES OUTSIDE PERIOD OF RECORD.--Flood of Apr. 7, 1947, reached a stage of 14.4 ft (4.39 m) from information by powerplant operator.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 3,180 ft<sup>3</sup>/s (90.1 m<sup>3</sup>/s) Mar. 26, gage height, 7.68 ft (2.341 m); minimum, 130 ft<sup>3</sup>/s (3.68 m<sup>3</sup>/s) Sept. 11, gage height, 2.73 ft (0.832 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	376	279	375	530	340	330	2770	469	334	861	215	229
2	415	282	476	500	350	320	2840	412	335	775	245	228
3	398	305	531	490	360	320	2840	420	292	714	297	244
4	383	273	559	490	370	320	2530	402	302	623	239	210
5	361	286	555	480	370	320	2180	411	281	572	240	217
6	338	279	509	480	370	320	2040	413	285	477	247	221
7	320	263	465	480	370	320	2240	401	284	462	225	223
8	335	283	382	480	360	320	2040	388	303	452	232	182
9	349	278	365	480	360	330	2000	409	270	407	242	211
10	350	277	360	470	360	340	2050	415	291	388	243	213
11	347	301	370	450	360	350	2010	406	278	364	282	167
12	351	301	380	430	360	370	1950	473	290	321	212	227
13	347	300	410	410	360	388	1870	641	262	330	234	437
14	347	298	440	400	360	478	1620	837	277	331	253	597
15	327	291	430	380	360	603	1420	956	291	262	188	554
16	313	297	520	380	360	686	1230	1010	280	321	303	557
17	304	299	600	370	360	736	1090	1000	261	257	268	596
18	296	311	680	370	360	763	973	946	284	254	252	861
19	310	318	900	360	360	804	886	853	279	264	324	1080
20	310	322	1200	350	350	886	820	780	275	278	301	1100
21	310	379	1350	350	340	1230	795	772	271	302	281	1110
22	291	381	1400	340	330	1610	750	734	263	304	242	1030
23	296	391	1300	340	330	1970	704	691	238	325	254	902
24	291	396	1200	340	330	2350	678	634	254	359	253	742
25	371	395	1000	340	330	2780	647	573	225	316	250	645
26	231	360	850	330	330	3080	580	501	655	302	215	555
27	272	348	750	330	330	3070	571	455	976	289	246	510
28	274	389	700	330	330	2830	522	425	1040	288	262	524
29	272	304	660	330	---	2700	493	389	1080	270	275	455
30	273	329	630	330	---	2670	495	382	989	242	245	457
31	272	---	580	330	---	2640	---	362	---	301	265	---
TOTAL	10030	9523	20977	12470	9850	36234	43634	17960	11725	12011	7830	15744
MEAN	324	317	677	402	352	1169	1454	579	391	387	253	524
MAX	415	396	1400	530	370	3080	2840	1010	1080	861	324	1110
MIN	231	263	360	330	330	320	493	362	225	242	188	167
CFSM	.42	.41	.88	.52	.46	1.51	1.88	.75	.51	.50	.33	.68
IN.	.48	.46	1.01	.60	.47	1.74	2.10	.86	.56	.58	.38	.76

CAL YR 1977 TOTAL 165089 MEAN 452 MAX 1560 MIN 196 CFSM .59 IN 7.94  
WTR YR 1978 TOTAL 207978 MEAN 570 MAX 3080 MIN 167 CFSM .74 IN 10.01

## STREAMS TRIBUTARY TO LAKE MICHIGAN

04118500 ROGUE RIVER NEAR ROCKFORD, MI

LOCATION.--Lat 43°05'00", long 85°35'30", in NE¼ sec.15, T.8 N., R.11 W., Kent County, Hydrologic Unit 04050006, on left bank at downstream side of highway bridge, 2.2 mi (3.5 km) upstream from mouth, and 3.0 mi (4.8 km) southwest of Rockford.

DRAINAGE AREA.--234 mi<sup>2</sup> (606 km<sup>2</sup>).

PERIOD OF RECORD.--February 1952 to current year.

GAGE.--Water-stage recorder. Datum of gage is 625.2 ft (190.56 m) National Geodetic Vertical Datum of 1929 (levels by Blass Survey Co.). Prior to Aug. 30, 1952, nonrecording gage at same site and datum.

REMARKS.--Records good except those for the winter period, which are fair. Some diurnal fluctuation caused by mills above station. Several observations of water temperature were made during the year.

AVERAGE DISCHARGE.--26 years, 227 ft<sup>3</sup>/s (6.429 m<sup>3</sup>/s), 13.17 in/yr (335 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 3,540 ft<sup>3</sup>/s (100 m<sup>3</sup>/s) Mar. 6, 1976, gage height, 9.29 ft (2.832 m); minimum, 28 ft<sup>3</sup>/s (0.79 m<sup>3</sup>/s) Jan. 22, 1967, gage height, 3.41 ft (1.039 m); minimum daily, 49 ft<sup>3</sup>/s (1.39 m<sup>3</sup>/s) Aug. 27, 1955.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 1,100 ft<sup>3</sup>/s (31.2 m<sup>3</sup>/s) Apr. 7, gage height, 7.05 ft (2.149 m); minimum, 86 ft<sup>3</sup>/s (2.44 m<sup>3</sup>/s) Aug. 15, gage height, 3.73 ft (1.137 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	226	155	288	210	170	160	749	210	139	254	92	139
2	204	181	296	205	170	160	876	201	131	215	94	130
3	200	180	327	200	170	160	833	195	130	196	105	126
4	204	185	337	195	170	160	748	190	130	187	101	124
5	206	187	322	190	170	160	826	193	130	175	97	119
6	199	185	304	190	165	160	972	196	128	159	92	114
7	178	176	279	185	160	160	993	192	126	145	90	111
8	216	168	227	180	160	160	1040	197	125	137	90	108
9	204	164	190	180	160	160	818	198	127	131	119	107
10	193	171	170	175	160	160	690	195	127	131	105	106
11	209	180	170	175	160	160	697	196	121	124	96	105
12	218	182	190	170	160	165	748	228	125	117	93	142
13	213	183	218	170	160	178	685	301	125	113	91	188
14	213	184	230	170	160	217	558	340	125	112	89	273
15	211	186	244	170	160	240	459	419	126	111	87	375
16	202	185	264	170	160	259	400	406	126	107	102	426
17	189	180	296	170	160	294	358	375	133	101	103	440
18	177	189	379	170	160	327	333	325	154	100	107	417
19	171	189	438	170	160	337	311	283	165	99	227	364
20	163	228	507	170	160	328	314	259	172	97	262	307
21	158	237	504	170	160	364	301	236	181	108	238	272
22	156	239	533	170	160	405	287	215	181	113	308	240
23	154	245	509	170	160	458	282	209	162	123	348	219
24	148	253	433	170	160	501	284	201	140	113	286	201
25	146	249	357	170	160	495	268	189	130	105	212	184
26	143	229	258	170	160	504	258	178	264	102	169	168
27	141	222	240	170	160	479	249	170	293	102	162	158
28	140	187	230	170	160	458	238	160	336	101	172	153
29	139	196	230	170	---	510	229	152	332	100	170	145
30	137	209	220	170	---	585	220	145	296	97	163	149
31	137	---	215	170	---	654	---	143	---	94	152	---
TOTAL	5595	5904	9405	5485	4535	9518	16024	7097	4980	3969	4622	6110
MEAN	180	197	303	177	162	307	534	229	166	128	149	204
MAX	226	253	533	210	170	654	1040	419	336	254	348	440
MIN	137	155	170	170	160	160	220	143	121	94	87	105
CFSM	.77	.84	1.30	.76	.69	1.31	2.28	.98	.71	.55	.64	.87
IN.	.89	.94	1.50	.87	.72	1.51	2.55	1.13	.79	.63	.73	.97

CAL YR 1977 TOTAL 66297 MEAN 182 MAX 685 MIN 76 CFSM .78 IN 10.54  
WTR YR 1978 TOTAL 83244 MEAN 228 MAX 1040 MIN 87 CFSM .97 IN 13.23

## STREAMS TRIBUTARY TO LAKE MICHIGAN

205

## 04119000 GRAND RIVER AT GRAND RAPIDS, MI

LOCATION.--Lat 42°57'52", long 85°40'35", in NE¼ sec.25, T.7 N., R.12 W., Kent County, Hydrologic Unit 04050006, on right bank 500 ft (152 m) upstream from bridge on Fulton Street, 1.7 mi (2.7 km) upstream from Plaster Creek, and at mile 41 (66 km).

DRAINAGE AREA.--4,900 mi<sup>2</sup> (12,700 km<sup>2</sup>), approximately.

PERIOD OF RECORD.--March 1901 to December 1905, January 1906 to August 1918 (gage heights only), October 1930 to current year. Monthly discharge only for some periods, published in WSP 1307. Gage-height records collected in this vicinity since 1907 are contained in reports of U.S. Weather Bureau.

REVISED RECORDS.--WSP 924: 1938 (M). WSP 1387: 1901-5, 1940.

GAGE.--Water-stage recorder. Datum of gage is 585.70 ft (178.521 m) National Geodetic Vertical Datum of 1929 (levels by City of Grand Rapids). March 1901 to August 1918, nonrecording gage at Fulton Street Bridge 500 ft (152 m) downstream and Oct. 1, 1930 to Oct. 26, 1953, water-stage recorder at sewage pumping station 1 mi (1.6 km) downstream at datum 2.99 ft (0.911 m) higher.

REMARKS.--Records good except those for the winter period, which are fair. Moderate diurnal fluctuation at low and medium flow caused by powerplants above station. Several observations of water temperature were made during the year. National Weather Service gage-height telemark at station.

AVERAGE DISCHARGE.--52 years, 3,543 ft<sup>3</sup>/s (100.3 m<sup>3</sup>/s), 9.82 in/yr (249 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 54,000 ft<sup>3</sup>/s (1,530 m<sup>3</sup>/s) Mar. 28, 1904, gage height, 19.5 ft (5.94 m), from graph based on gage readings, site then in use; minimum daily, 381 ft<sup>3</sup>/s (10.8 m<sup>3</sup>/s) Aug. 9, 17, 1936.

EXTREMES OUTSIDE PERIOD OF RECORD.--Maximum discharge since at least 1901, 54,000 ft<sup>3</sup>/s (1,530 m<sup>3</sup>/s) Mar. 28, 1904.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 16,900 ft<sup>3</sup>/s (479 m<sup>3</sup>/s) Apr. 4, gage height, 15.09 ft (4.599 m); minimum, 765 ft<sup>3</sup>/s (21.7 m<sup>3</sup>/s) Aug. 16, gage height, 2.65 ft (0.808 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2430	1740	2240	3900	1700	2200	14500	3880	2500	2690	1020	1340
2	2450	1830	2430	3500	1800	2200	15300	3140	2200	2480	1130	1110
3	2420	2110	2780	3000	1900	2100	16500	3090	2700	2360	1170	1210
4	2370	2150	2960	2900	2000	2000	16800	3280	1800	2270	1110	1150
5	2400	2130	2850	3000	2000	2000	16400	3210	1800	2050	1190	1100
6	2330	1980	2840	3000	2100	2000	15900	3040	1800	2070	1220	1080
7	2220	1830	2590	3000	2000	2000	15300	3040	1800	1810	1160	1040
8	2350	1430	2240	3100	1900	2000	14500	3060	1800	1840	1060	989
9	2360	1470	1240	3200	1900	2000	14100	2940	1800	1880	1770	949
10	2260	1720	1370	2700	2000	2100	13600	2920	1800	1810	1390	960
11	2260	1590	1600	2400	2100	2200	13200	3090	1800	1690	1180	947
12	2260	1550	2310	2300	2000	2300	12600	3250	1700	1500	1130	1050
13	2180	1700	2020	2200	2000	2600	11900	3950	1700	1420	1070	1510
14	2210	1740	2660	1900	2000	3000	11000	4530	1700	1380	967	2100
15	2320	1730	2930	2000	2000	3300	9910	5030	1700	1380	884	2390
16	2180	1770	3050	2100	2000	3500	8780	5150	1600	1320	1180	2490
17	2010	1810	3080	2100	2000	3800	7660	5150	1600	1280	1220	2440
18	2060	1860	3420	2100	2100	4200	6770	5190	1600	1210	1100	2580
19	2010	1820	4330	2100	2200	4490	5970	5080	1700	1170	1900	2740
20	1930	1930	5180	2100	2100	4850	5840	4800	1800	1110	1690	3110
21	1960	2040	5800	2000	2100	5700	5670	4700	1700	1250	1580	3240
22	1990	2200	5830	2000	2100	6790	5590	4560	1700	1380	1980	2920
23	1890	2410	5730	2000	2100	8200	5420	4380	1700	1330	2270	2750
24	1740	2180	5560	2000	2100	9350	5260	4230	1600	1340	2250	2450
25	1780	1970	5330	2000	2000	10200	5130	4070	1500	1410	2190	2210
26	1900	2160	4500	2000	2000	11100	4810	3820	2620	1330	2040	2030
27	1750	2000	3300	2000	2000	12000	4820	3570	3580	1310	1700	1900
28	1730	1920	3000	1700	2000	12500	4630	3410	3670	1270	1530	1730
29	1780	2260	3200	1700	---	12800	4400	3000	3350	1250	1500	1660
30	1690	1990	3500	1700	---	12900	4090	2900	2850	1240	1550	1700
31	1630	---	3700	1700	---	13500	---	2700	---	1110	1460	---
TOTAL	64850	57020	103570	73400	56200	169880	296350	118160	61170	48940	44591	54995
MEAN	2092	1901	3341	2368	2007	5480	9878	3812	2039	1579	1438	1833
MAX	2450	2410	5830	3900	2200	13500	16800	5190	3670	2690	2270	3240
MIN	1630	1430	1240	1700	1700	2000	4090	2700	1500	1110	884	947
FSM	.43	.39	.68	.48	.41	1.12	2.02	.78	.42	.32	.29	.37
4.	.49	.43	.79	.56	.43	1.29	2.25	.90	.46	.37	.34	.42
4L YR 1977 TOTAL	889873	MEAN	2438	MAX	8500	MIN	674	CFSM	.50	IN	6.76	
4R YR 1978 TOTAL	1149126	MEAN	3148	MAX	16800	MIN	844	CFSM	.64	IN	8.72	



## STREAMS TRIBUTARY TO LAKE MICHIGAN

04121300 CLAM RIVER AT VOGEL CENTER, MI

LOCATION.--Lat 44°12'02", long 85°03'10", in SW¼ NW¼ sec.21, T.21 N., R.6 W., Missaukee County, Hydrologic Unit 04060102, on left bank 10 ft (3 m) downstream from bridge on county road, 0.5 mi (0.8 km) north of Vogel Center, and 3.5 mi (5.6 km) southeast of Falmouth.

DRAINAGE AREA.--243 mi<sup>2</sup> (629 km<sup>2</sup>).

PERIOD OF RECORD.--June 1966 to current year.

GAGE.--Water-stage recorder. Altitude of gage is 1,130 ft (344 m), from topographic map.

REMARKS.--Records good except those for the winter period, which are poor. Some regulation at low flow by dams above station. Several observations of water temperature were made during the year.

AVERAGE DISCHARGE.--12 years, 127 ft<sup>3</sup>/s (3.597 m<sup>3</sup>/s), 7.10 in/yr (180 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,150 ft<sup>3</sup>/s (32.6 m<sup>3</sup>/s) Apr. 13, 1971, gage height, 6.33 ft (1.929 m); minimum, 29 ft<sup>3</sup>/s (0.82 m<sup>3</sup>/s) Nov. 3, 1969, result of freezeup.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 499 ft<sup>3</sup>/s (14.1 m<sup>3</sup>/s) Apr. 8, gage height, 4.63 ft (1.411 m), only peak above base of 350 ft<sup>3</sup>/s (9.91 m<sup>3</sup>/s); minimum, 43 ft<sup>3</sup>/s (1.22 m<sup>3</sup>/s) Sept. 11; minimum gage height, 2.43 ft (0.741 m) Aug. 15.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	76	99	135	110	103	95	162	146	86	68	57	59
2	89	108	164	110	102	88	212	143	84	76	57	56
3	79	112	171	110	102	85	230	140	81	81	61	55
4	70	110	160	110	101	93	216	138	79	76	59	54
5	64	106	138	109	100	90	224	132	77	71	57	58
6	61	103	125	108	100	83	299	112	78	67	55	58
7	59	107	115	107	99	88	401	106	77	65	54	55
8	71	117	105	106	98	86	481	101	76	65	53	53
9	106	112	100	105	98	86	457	101	77	64	52	52
10	101	110	98	103	98	90	354	113	75	66	51	51
11	88	114	100	100	98	94	309	102	72	63	51	49
12	92	121	110	102	98	100	311	107	69	62	51	60
13	97	120	120	103	98	108	306	166	69	63	51	67
14	89	118	131	104	97	106	289	211	69	61	51	116
15	83	116	138	105	96	105	258	207	69	61	50	179
16	81	120	142	105	95	105	234	162	71	60	57	143
17	76	126	147	106	94	103	215	136	81	59	65	152
18	76	124	161	106	93	100	192	124	138	58	61	152
19	77	121	183	106	93	97	169	107	150	60	65	162
20	77	124	197	106	93	99	189	100	113	62	63	141
21	77	139	186	106	93	99	196	103	91	63	58	131
22	83	137	181	105	94	99	189	108	80	62	58	117
23	92	125	170	105	88	103	196	106	74	62	57	107
24	102	121	167	105	83	106	212	77	71	59	54	99
25	117	99	118	105	91	105	195	88	70	60	53	95
26	116	88	100	105	96	104	177	84	71	63	53	93
27	105	100	103	105	95	103	167	82	70	68	55	92
28	101	108	108	104	95	109	160	81	68	64	76	93
29	85	118	110	103	---	122	154	86	66	62	79	92
30	89	126	110	103	---	122	151	93	65	61	73	94
31	97	---	110	103	---	127	---	91	---	58	65	---
TOTAL	2676	3449	4203	3270	2691	3100	7305	3653	2417	1990	1802	2845
MEAN	86.3	115	136	105	96.1	100	244	118	80.6	64.2	58.1	94.8
MAX	117	139	197	110	103	127	481	211	150	81	79	143
MIN	59	88	98	100	83	83	151	77	65	58	50	49
CFSM	.36	.47	.56	.43	.40	.41	1.00	.44	.33	.26	.24	.39
IN.	.41	.53	.64	.50	.41	.47	1.12	.56	.37	.30	.28	.44

CAL YR 1977 TOTAL 33749 MEAN 92.5 MAX 400 MIN 50 CFSM .38 IN 5.17  
WTR YR 1978 TOTAL 39401 MEAN 108 MAX 481 MIN 49 CFSM .44 IN 6.03

## 04121500 MUSKOGON RIVER AT EVART, MI

LOCATION.--Lat 43°53'57", long 85°15'19", in NW¼ NE¼ sec.3, T.17 N., R.8 W., Osceola County, Hydrologic Unit 04060102, on right bank 500 ft (152 m) downstream from bridge on U.S. Highway 10 in Ewart, 0.4 mi (0.6 km) upstream from Twin Creek, and at mile 123.9 (199.4 km).

DRAINAGE AREA.--1,450 mi<sup>2</sup> (3,760 km<sup>2</sup>) approximately.

## WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--October 1930 to September 1931, October 1933 to current year. Monthly discharge only for some periods, published in WSP 1307.

REVISED RECORDS.--WSP 1437: 1934, 1947 (M).

GAGE.--Water-stage recorder. Datum of gage is 977.72 ft (298.009 m) National Geodetic Vertical Datum of 1929. Prior to Nov. 7, 1956, nonrecording gages at sites 400 ft (122 m) and 500 ft (152 m) upstream at present datum.

REMARKS.--Water-discharge records good except those for the winter period, which are fair. Some regulation during low flow from dams above station.

AVERAGE DISCHARGE.--46 years, 990 ft<sup>3</sup>/s (28.04 m<sup>3</sup>/s), 9.27 in/yr (235 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 7,790 ft<sup>3</sup>/s (221 m<sup>3</sup>/s) Mar. 29, 1976; maximum gage height, 14.42 ft (4.395 m) Apr. 9, 1959; minimum discharge observed, 164 ft<sup>3</sup>/s (4.64 m<sup>3</sup>/s) Dec. 20, 1947, result of freezeup.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 4,510 ft<sup>3</sup>/s (128 m<sup>3</sup>/s) Apr. 11, gage height, 11.09 ft (3.380 m); minimum, 335 ft<sup>3</sup>/s (9.49 m<sup>3</sup>/s) Aug. 15, 16, gage height, 6.53 ft (1.990 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	583	694	980	990	720	730	2110	1310	623	572	390	525
2	593	760	1360	990	730	770	2400	1240	616	623	389	486
3	595	796	1440	980	740	780	2550	1170	591	627	389	400
4	587	796	1370	970	740	780	2740	1110	566	603	386	438
5	570	787	1270	960	760	780	2890	1060	552	566	383	424
6	549	770	1200	940	760	750	3050	1010	535	542	377	418
7	528	764	1100	930	760	780	3720	939	517	529	372	410
8	590	759	1000	910	760	780	4020	888	516	513	367	400
9	690	761	900	890	760	760	4270	867	505	494	365	393
10	762	792	800	880	760	740	4340	882	495	488	360	387
11	807	806	760	860	760	750	4470	868	493	478	347	384
12	861	806	752	840	760	802	4380	931	501	466	346	421
13	876	806	944	830	760	832	4180	1360	498	461	348	448
14	878	800	1080	820	760	878	3890	1780	475	457	345	766
15	866	805	1150	800	750	880	3510	1830	459	448	337	1240
16	834	826	1230	790	740	898	3190	1790	476	433	359	1240
17	825	828	1240	780	740	900	2930	1660	504	428	370	1270
18	821	832	1360	760	740	920	2730	1550	1050	418	384	1340
19	809	823	1580	750	740	860	2580	1470	1460	415	409	1430
20	798	898	1740	740	740	900	2440	1420	1480	416	399	1440
21	776	1060	1720	740	740	900	2290	1360	1310	419	378	1450
22	756	1050	1630	720	740	910	2140	1230	1060	429	366	1350
23	738	1010	1630	720	740	950	2010	1110	923	437	357	1300
24	734	976	1520	720	740	1100	1920	1030	834	424	354	1240
25	736	928	1400	720	730	1080	1820	964	758	413	350	1170
26	749	840	1250	720	720	1000	1710	900	743	407	348	1120
27	748	808	1100	730	710	1020	1600	858	707	420	368	1040
28	729	800	1000	730	700	1080	1500	777	640	427	784	1020
29	711	790	1000	720	---	1230	1440	718	603	415	856	943
30	693	820	1000	720	---	1310	1380	674	573	411	697	890
31	687	---	1000	720	---	1460	---	644	---	403	590	---
TOTAL	22484	24991	37506	25370	20800	28310	84200	35400	21073	14582	12870	26063
MEAN	725	833	1210	818	743	913	2807	1142	702	470	415	369
MAX	878	1060	1740	990	760	1460	4470	1830	1480	627	856	1440
MIN	528	694	752	720	700	730	1380	644	469	403	337	384
CFSM	.50	.57	.83	.56	.51	.63	1.94	.79	.48	.32	.29	.60
IN.	.58	.64	.96	.65	.53	.73	2.16	.91	.54	.37	.33	.67

CAL YR 1977 TOTAL 270352 MEAN 741 MAX 2790 MIN 305 CFSM .51 IN 6.94  
WTR YR 1978 TOTAL 353649 MEAN 969 MAX 4470 MIN 337 CFSM .67 IN 9.07

STREAMS TRIBUTARY TO LAKE MICHIGAN  
04121500 MUSKEGON RIVER AT EVART, MI--CONTINUED  
WATER-QUALITY RECORDS

## PERIOD OF DAILY RECORD.--

WATER TEMPERATURES: November 1956 to current year.

INSTRUMENTATION.--Temperature recorder since November 1956.

## EXTREMES FOR PERIOD OF DAILY RECORD.--

WATER TEMPERATURES: Maximum, 28.0°C July 1, 1963, July 20, 1977; minimum, 0.0°C on many days during winter periods.

## EXTREMES FOR CURRENT YEAR.--

WATER TEMPERATURES: Maximum, 24.5°C June 29, July 20, Aug. 14, 15; minimum, 0.0°C on many days during winter period.

## TEMPERATURE (DEG. C) OF WATER, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DAY	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN
	OCTOBER		NOVEMBER		DECEMBER		JANUARY		FEBRUARY		MARCH	
1	13.0	11.0	9.5	8.0	.0	.0	.0	.0	.0	.0	.5	.0
2	11.5	10.0	11.0	9.5	.0	.0	.0	.0	.0	.0	.5	.0
3	11.0	9.5	11.0	10.5	.0	.0	1.0	.0	.0	.0	.5	.0
4	11.5	9.5	11.0	10.0	.0	.0	.5	.5	.0	.0	.0	.0
5	11.0	10.0	10.0	9.0	.0	.0	.5	.5	.0	.0	.5	.0
6	10.5	9.0	9.0	9.0	.0	.0	.5	.0	.0	.0	.5	.0
7	9.5	9.0	9.5	9.0	.0	.0	.0	.0	.0	.0	.5	.0
8	9.0	8.5	10.5	9.5	.0	.0	.0	.0	.0	.0	.5	.0
9	8.5	8.0	10.5	10.5	.0	.0	.0	.0	.0	.0	.5	.0
10	8.0	6.5	10.5	8.5	.0	.0	.0	.0	.0	.0	.5	.0
11	8.0	7.0	8.5	11.5	.0	.0	.0	.0	.0	.0	.5	.0
12	8.0	6.5	6.0	4.5	.0	.0	.0	.0	.0	.0	.5	.0
13	8.0	6.5	4.5	4.0	.0	.0	.0	.0	.0	.0	.5	.0
14	7.0	6.0	4.0	3.5	.0	.0	.0	.0	.0	.0	.0	.0
15	7.0	7.0	3.5	2.0	.0	.0	.0	.0	.0	.0	.5	.0
16	7.0	6.0	3.0	2.0	.0	.0	.0	.0	.0	.0	.5	.0
17	6.0	5.0	3.0	2.0	.0	.0	.0	.0	.0	.0	.5	.0
18	6.0	5.5	2.0	2.0	.0	.0	.0	.0	.0	.0	.5	.0
19	6.5	6.0	3.0	2.0	.0	.0	.0	.0	.0	.0	.0	.0
20	7.0	6.0	3.0	3.0	.0	.0	.0	.0	.0	.0	.5	.0
21	8.0	6.0	3.0	2.0	.0	.0	.0	.0	.0	.0	.5	.0
22	8.0	7.0	2.0	1.5	.0	.0	.0	.0	.0	.0	.5	.0
23	8.0	6.5	1.5	1.0	.0	.0	.0	.0	.0	.0	.5	.0
24	8.0	6.5	1.0	1.0	.0	.0	.0	.0	.5	.0	.5	.0
25	10.0	9.0	1.0	.0	.0	.0	.0	.0	.0	.0	.5	.0
26	10.5	10.0	.0	.0	.5	.0	.0	.0	.0	.0	1.0	.5
27	10.5	10.0	.0	.0	.5	.5	.0	.0	.0	.0	3.0	1.0
28	10.0	9.0	.0	.0	.5	.5	.0	.0	.0	.0	4.0	2.0
29	10.0	9.0	.0	.0	.5	.0	.0	.0	---	---	3.5	3.0
30	9.5	8.5	.0	.0	.0	.0	.0	.0	---	---	3.5	3.0
31	9.0	8.5	---	---	.0	.0	.0	.0	---	---	4.0	3.0
MONTH	13.0	5.0	11.0	.0	.5	.0	1.0	.0	.5	.0	4.0	.0

STREAMS TRIBUTARY TO LAKE MICHIGAN  
04121500 MUSKEGON RIVER AT EVART, MI---CONTINUED

209

TEMPERATURE (DEG. C) OF WATER, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DAY	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN
	APRIL		MAY		JUNE		JULY		AUGUST		SEPTEMBER	
1	3.5	1.5	11.5	10.0	22.0	20.0	23.5	18.5	21.0	16.5	19.0	16.5
2	1.5	1.0	12.0	10.5	21.5	19.0	18.5	17.0	21.0	18.0	20.0	16.5
3	1.5	1.0	13.0	10.5	19.5	16.5	20.5	16.5	20.0	18.0	20.0	18.0
4	1.0	1.0	12.0	11.0	18.5	15.5	21.5	18.0	20.0	16.0	19.5	16.5
5	2.0	1.0	11.0	10.5	19.0	15.5	22.0	19.5	20.0	15.5	19.5	17.0
6	2.0	1.5	11.0	9.5	19.5	16.0	23.5	20.5	21.0	16.5	19.5	17.0
7	2.0	1.0	13.5	10.5	19.5	18.0	23.5	21.5	21.5	18.0	20.5	18.0
8	3.0	2.0	13.0	12.0	19.5	17.0	23.5	20.5	22.0	18.0	22.0	19.0
9	3.0	2.0	12.0	10.5	20.0	16.5	22.0	19.5	23.0	20.0	21.5	20.0
10	2.0	2.0	13.5	10.0	20.0	16.5	21.5	19.0	21.5	18.0	20.5	18.5
11	3.5	2.0	13.5	12.0	21.5	18.0	20.5	17.0	21.0	17.0	21.0	18.5
12	4.0	3.5	13.5	13.5	21.5	19.5	21.0	17.0	22.0	18.5	21.0	16.5
13	4.5	4.0	13.5	13.0	19.5	16.0	21.0	19.0	23.5	19.0	16.5	14.5
14	5.0	4.5	13.0	13.0	18.0	14.5	22.0	18.5	24.5	20.0	14.5	13.5
15	5.0	5.0	13.0	12.0	18.0	15.0	23.5	20.0	24.5	20.5	15.5	14.5
16	5.5	5.0	13.0	13.0	17.0	15.5	23.0	19.0	23.5	20.0	16.5	14.0
17	6.5	5.5	15.0	13.0	16.5	16.0	23.0	19.0	23.0	18.5	16.0	15.5
18	6.5	6.5	17.0	15.0	18.5	16.0	23.0	20.5	22.0	19.5	15.0	14.5
19	6.5	6.0	19.5	17.0	19.5	17.0	22.0	20.5	21.0	19.5	14.5	14.5
20	6.0	6.0	19.5	18.5	20.0	18.5	24.5	20.5	21.0	16.5	17.0	15.0
21	6.5	5.5	19.0	17.0	20.5	19.5	24.0	21.5	21.5	16.5	17.0	15.5
22	8.0	6.0	19.0	17.0	20.0	18.5	24.0	21.5	21.5	17.0	15.5	14.5
23	8.0	7.0	18.5	16.5	19.5	18.0	23.5	21.0	22.0	18.5	14.5	13.5
24	8.5	7.0	19.5	16.5	20.0	17.0	23.0	19.5	23.0	20.0	14.5	13.0
25	10.0	8.5	20.5	18.0	20.5	19.5	23.0	19.5	23.0	20.0	14.5	13.5
26	11.0	9.5	21.5	19.0	22.0	20.0	22.0	20.0	21.0	19.0	13.5	12.0
27	12.0	10.0	23.0	20.0	24.0	21.0	22.0	19.0	21.0	20.0	13.5	13.0
28	13.0	11.0	23.5	21.0	24.0	21.0	21.0	17.0	20.0	19.0	13.0	11.5
29	14.0	11.5	23.5	21.5	24.5	21.0	20.5	19.0	20.0	19.0	12.0	11.0
30	13.0	11.5	23.0	21.5	24.0	21.0	20.0	16.5	20.0	18.0	11.5	11.5
31	---	---	23.0	20.0	---	---	20.0	15.5	19.0	16.5	---	---
MONTH	14.0	1.0	23.5	9.5	24.5	14.5	24.5	15.5	24.5	15.5	22.0	11.0

## STREAMS TRIBUTARY TO LAKE MICHIGAN

04121900 LITTLE MUSKOGON RIVER NEAR MORLEY, MI

LOCATION.--Lat 43°30'09", long 85°20'33", in SW $\frac{1}{4}$  SW $\frac{1}{4}$  sec.24, T.13 N., R.9 W., Mecosta County, Hydrologic Unit 04060102, on right bank at upstream side of highway bridge on 130th Avenue, 0.5 mi (0.8 km) downstream from Rustford Dam, and 5.2 mi (8.4 km) east of Morley.

DRAINAGE AREA.--138 mi<sup>2</sup> (357 km<sup>2</sup>).

## WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--October 1966 to current year.

GAGE.--Water-stage recorder. Altitude of gage is 920 ft (280 m), from topographic map.

REMARKS.--Water-discharge records good except those for the winter period, which are fair. Some regulation by dams above station.

AVERAGE DISCHARGE.--12 years, 126 ft<sup>3</sup>/s (3.568 m<sup>3</sup>/s), 12.40 in/yr (315 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,010 ft<sup>3</sup>/s (28.6 m<sup>3</sup>/s) Aug. 31, 1975, gage height, 5.92 ft (1.804 m); minimum, 31 ft<sup>3</sup>/s (0.88 m<sup>3</sup>/s) June 3, 1972; minimum gage height, 1.59 ft (0.485 m) June 3, 1972, May 22, 1977.

EXTREMES FOR CURRENT YEAR.--Peak discharges above base of 400 ft<sup>3</sup>/s (11.3 m<sup>3</sup>/s) and maximum (\*):

Date	Time	Discharge (ft <sup>3</sup> /s) (m <sup>3</sup> /s)	Gage height (ft) (m)	Date	Time	Discharge (ft <sup>3</sup> /s) (m <sup>3</sup> /s)	Gage height (ft) (m)
Apr. 2	0030	*477 13.5	*3.81 1.161	Apr. 7	0430	463 13.1	3.74 1.140

Minimum discharge, 45 ft<sup>3</sup>/s (1.27 m<sup>3</sup>/s) Aug. 1, 2, 8, gage height, 1.67 ft (0.509 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	209	95	181	123	91	96	415	97	79	76	47	86
2	199	117	220	122	91	96	439	98	78	85	50	64
3	159	114	189	120	91	95	368	95	75	82	63	62
4	131	107	162	118	90	95	348	92	73	76	54	59
5	115	99	141	115	90	95	335	91	74	72	50	57
6	108	96	127	113	90	92	363	93	72	69	49	58
7	108	95	122	112	89	89	451	95	71	67	49	55
8	112	94	122	110	89	88	423	98	76	67	46	55
9	120	91	128	110	89	88	383	103	73	65	81	55
10	130	96	130	108	89	88	335	100	70	64	69	55
11	140	101	123	106	89	89	357	97	69	60	58	55
12	151	97	121	105	89	90	319	122	75	60	55	65
13	141	92	117	104	89	94	283	220	75	62	52	79
14	127	89	121	100	90	105	243	259	70	62	50	141
15	118	93	124	94	90	109	209	231	69	59	48	203
16	113	102	126	96	89	107	187	180	72	57	70	142
17	106	97	133	98	88	105	173	153	80	56	70	111
18	106	94	178	96	90	102	163	137	122	55	62	123
19	110	90	215	99	88	106	172	124	109	55	233	130
20	106	132	233	99	90	109	169	128	91	58	167	114
21	103	162	213	97	92	123	164	165	84	60	98	164
22	102	137	199	98	93	127	154	141	82	60	83	134
23	99	117	188	97	93	145	125	127	78	58	77	108
24	97	114	168	97	93	152	114	119	76	55	73	97
25	95	110	155	98	94	141	112	112	79	53	70	89
26	94	115	145	96	94	131	109	103	97	67	68	85
27	93	112	135	95	95	124	105	87	92	67	74	84
28	91	100	126	95	96	147	101	85	81	58	94	92
29	88	100	124	94	---	180	101	82	77	57	86	88
30	87	105	123	94	---	172	99	81	74	55	75	99
31	87	---	123	93	---	213	---	81	---	51	70	---
TOTAL	3645	3163	4712	3201	2541	3593	7319	3796	2397	1948	2291	2779
MEAN	118	105	152	103	90.4	116	244	122	79.9	62.8	73.9	92.6
MAX	209	162	233	123	96	213	451	259	122	85	233	203
MIN	87	89	117	93	88	88	99	81	69	51	46	55
CFSM	.86	.76	1.10	.75	.66	.84	1.77	.88	.58	.46	.54	.67
IN.	.98	.85	1.27	.86	.68	.97	1.97	1.02	.65	.53	.62	.75

CAL YR 1977 TOTAL 37945 MEAN 104 MAX 387 MIN 37 CFSM .75 IN 10.23  
WTR YR 1978 TOTAL 41385 MEAN 113 MAX 451 MIN 46 CFSM .82 IN 11.16



## STREAMS TRIBUTARY TO LAKE MICHIGAN

211

04121900 LITTLE MUSKEGON RIVER NEAR MORLEY, MI--CONTINUED

## WATER-QUALITY RECORDS

## PERIOD OF DAILY RECORD.--

WATER TEMPERATURES: November 1966 to current year.

INSTRUMENTATION.--Temperature recorder since November 1966.

## EXTREMES FOR PERIOD OF DAILY RECORD.--

WATER TEMPERATURES: Maximum, 28.0°C Aug. 23, 1968, June 28, 1971; minimum, 0.0°C on many days during winter periods.

## EXTREMES FOR CURRENT YEAR.--

WATER TEMPERATURES: Maximum, 26.0°C June 29; minimum, 0.0°C on many days during winter period.

## TEMPERATURE (DEG. C) OF WATER, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DAY	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN
	OCTOBER		NOVEMBER		DECEMBER		JANUARY		FEBRUARY		MARCH	
1	13.0	11.5	12.0	10.5	2.0	1.0	.5	.5	.5	.5	.5	.0
2	12.0	10.5	13.5	12.0	2.0	1.5	.5	.5	1.0	.5	.0	.0
3	12.5	10.0	13.5	12.5	1.5	1.0	.5	.5	1.0	.5	.0	.0
4	11.5	10.0	13.5	10.5	1.0	.5	.5	.5	1.0	.5	.0	.0
5	12.5	11.5	10.5	9.0	1.5	.5	.5	.5	.5	.5	.0	.0
6	11.5	9.5	10.5	10.0	1.5	1.0	1.5	.5	.5	.5	2.0	.0
7	10.5	8.0	11.5	10.5	1.0	.5	2.5	1.5	.5	.5	1.0	.0
8	10.5	9.0	12.5	11.5	1.0	1.0	2.5	1.0	.5	.0	1.5	.0
9	10.5	9.0	12.5	12.0	1.0	.5	1.0	1.0	.5	.0	1.5	.0
10	10.5	8.0	12.5	7.5	1.0	.5	1.0	1.0	.5	.0	3.5	.0
11	10.0	9.0	7.5	5.5	1.0	.5	1.0	.5	.5	.0	3.5	2.5
12	9.5	8.0	5.5	4.5	1.0	.5	1.0	.5	.5	.0	5.5	2.0
13	9.5	7.5	5.0	4.0	2.0	.5	.5	.5	.5	.0	5.0	3.0
14	10.0	7.0	4.5	4.5	2.5	2.0	1.0	.5	.5	.0	4.5	2.0
15	10.0	8.5	5.5	4.5	3.0	2.5	1.0	.5	.5	.0	3.0	2.0
16	9.5	7.5	6.5	5.5	3.5	3.0	1.0	.5	.5	.0	3.5	2.0
17	8.5	5.5	6.5	5.0	3.0	2.5	1.0	.5	.5	.0	4.0	1.5
18	9.0	7.5	5.5	5.0	3.0	1.0	1.0	.5	.5	.0	2.5	.0
19	10.0	8.5	5.0	4.0	2.0	1.0	.5	.5	.5	.0	5.5	1.0
20	10.0	8.0	6.5	5.0	2.0	1.0	.5	.5	.5	.0	4.5	1.0
21	10.5	7.5	6.5	4.0	1.0	.5	1.0	.5	.5	.0	4.5	3.0
22	10.5	9.5	4.0	3.0	1.0	.5	1.0	.5	.5	.0	3.5	2.5
23	9.5	8.0	3.0	2.5	1.5	.5	.5	.5	.5	.0	5.5	2.0
24	11.0	8.5	4.0	2.5	2.0	1.0	.5	.5	.5	.0	4.0	1.5
25	12.5	10.5	3.0	1.5	2.0	1.0	.5	.5	.5	.0	2.0	.5
26	13.0	12.0	1.5	1.0	1.0	.5	.5	.5	.5	.0	2.5	1.5
27	12.0	11.0	1.5	1.5	1.0	.5	.5	.5	.5	.0	6.5	2.0
28	11.0	8.5	1.5	1.5	.5	.5	.5	.5	.5	.0	6.5	3.5
29	11.0	9.5	2.0	1.5	.5	.5	.5	.5	---	---	4.0	2.5
30	11.0	8.5	1.5	1.5	.5	.5	.5	.5	---	---	3.5	2.0
31	10.5	8.5	---	---	.5	.5	1.0	.5	---	---	6.0	3.0
MONTH	13.0	5.5	13.5	1.0	3.5	.5	2.5	.5	1.0	.0	6.5	.0

STREAMS TRIBUTARY TO LAKE MICHIGAN  
04121900 LITTLE MUSKEGON RIVER NEAR MORLEY, MI--CONTINUED

TEMPERATURE (DEG. C) OF WATER, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DAY	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN
	APRIL		MAY		JUNE		JULY		AUGUST		SEPTEMBER	
1	3.5	2.5	13.5	8.0	24.0	19.0	22.0	17.0	24.0	17.5	21.0	16.0
2	2.0	.5	14.0	8.0	22.0	18.5	17.5	16.5	21.5	18.5	21.5	17.5
3	1.5	1.0	15.0	9.0	18.5	15.5	23.0	16.5	22.5	18.0	21.5	19.0
4	3.0	1.5	13.5	10.0	18.5	15.0	24.0	17.0	21.5	16.0	20.5	16.5
5	5.5	2.5	10.5	9.0	21.5	15.0	24.0	18.5	22.0	15.5	21.5	17.5
6	5.5	4.0	14.0	9.0	22.0	16.0	25.5	20.0	23.0	16.0	22.0	18.5
7	7.5	3.0	15.0	10.5	21.5	18.0	24.0	21.5	21.5	18.0	23.5	18.5
8	8.0	5.5	14.0	12.5	21.0	17.0	24.0	20.5	24.0	18.0	24.0	19.5
9	7.5	4.5	12.5	11.0	21.5	15.5	24.0	18.5	23.5	20.5	22.5	20.5
10	6.0	4.0	17.0	10.5	22.0	16.0	22.5	18.5	23.0	17.5	23.0	18.5
11	6.0	5.5	14.0	12.5	24.5	18.0	22.5	16.0	21.0	17.0	23.5	19.5
12	8.0	4.0	14.0	13.5	22.5	17.5	22.5	16.0	23.5	18.5	22.0	16.5
13	8.0	5.5	14.5	13.0	20.0	14.5	22.0	19.0	25.0	19.0	16.5	14.0
14	8.0	4.0	14.5	13.5	17.0	13.5	24.0	17.5	25.0	20.0	16.5	14.0
15	7.0	5.0	15.0	14.0	20.5	15.0	24.5	19.0	24.5	20.5	17.5	15.5
16	9.0	4.5	15.5	14.0	18.5	17.0	24.0	17.5	24.0	19.5	18.5	16.0
17	10.0	6.0	17.0	13.0	18.5	17.0	24.0	18.0	23.0	18.0	17.5	16.0
18	9.5	7.0	20.5	15.0	21.0	17.5	22.0	20.0	21.5	19.5	17.0	15.5
19	8.0	6.5	22.0	16.5	23.0	17.5	23.5	20.0	21.0	20.0	17.5	16.0
20	8.0	7.0	20.0	18.0	23.0	18.0	25.0	20.5	20.5	17.5	20.0	17.0
21	10.5	6.0	19.0	15.0	23.0	19.5	24.0	22.0	20.5	16.5	19.5	16.5
22	11.5	6.5	20.0	14.5	21.5	17.0	25.0	21.0	22.0	17.0	16.5	14.5
23	10.5	7.5	20.0	15.5	20.5	17.0	23.5	21.0	22.0	18.5	15.5	13.0
24	11.5	7.5	22.0	16.0	22.5	16.5	23.0	18.0	24.0	19.5	16.5	13.0
25	13.0	7.0	23.0	17.0	21.0	19.5	24.0	18.5	22.5	20.0	16.0	13.5
26	14.0	8.0	24.0	18.5	22.0	19.5	22.0	20.0	20.0	18.5	15.5	12.5
27	15.0	9.5	25.0	19.0	24.5	20.0	24.0	19.0	20.0	19.0	14.5	13.5
28	16.0	9.0	25.0	20.0	25.0	20.0	22.5	17.0	20.5	19.0	14.0	11.0
29	16.0	11.5	24.0	20.0	26.0	20.0	21.0	19.5	22.0	18.0	13.5	11.5
30	15.0	10.0	22.5	20.5	23.0	20.0	21.0	16.5	20.5	17.5	14.0	13.0
31	---	---	24.0	18.0	---	---	22.0	15.5	20.5	16.5	---	---
MONTH	16.0	.5	25.0	8.0	26.0	13.5	25.5	15.5	25.0	15.5	24.0	11.0

## 04122000 MUSKEGON RIVER AT NEWAYGO, MI

LOCATION.--Lat 43°25'20", long 85°48'04", in NE¼ NE¼ sec.24, T.12 N., R.13 W., Newaygo County, Hydrologic Unit 04060102, on left bank near nonoperative powerplant at Newaygo, 600 ft (183 m) downstream from Penoyer Creek and at mile 39.1 (62.9 km).

DRAINAGE AREA.--2,350 mi<sup>2</sup> (6,090 km<sup>2</sup>), approximately.

PERIOD OF RECORD.--July to December 1908, July 1909 to July 1915, January 1916 to December 1919, October 1930 to current year. Monthly discharge only for some periods, published in WSP 1307. Records for June 1901 to December 1906, published in WSP 129, 170, and 206, have been found to be unreliable and should not be used.

REVISED RECORDS.--WSP 974: 1933, 1935, 1937-38. WSP 1307: 1940(M). See also PERIOD OF RECORD.

GAGE.--Water-stage recorder. Datum of gage is 625.83 ft (190.753 m) National Geodetic Vertical Datum of 1929. October 1930 to January 1939, nonrecording gage, and Jan. 31, 1939, to Sept. 30, 1963, water-stage recorder at present site at datum 40.0 ft (12.192 m) lower.

REMARKS.--Records good except those for the winter period and those for the period of no gage-height record, Dec. 19 to Jan. 31, which are fair. Flow regulated by powerplants above station, the largest of which are at Croton Dam, Hardy Dam (since 1931), and Rogers Dam. Since Dec. 27, 1965, powerplant at Newaygo nonoperative, and in January 1969, dam at Newaygo was removed. Several observations of water temperature were made during the year. National Weather Service gage-height telemark at station.

AVERAGE DISCHARGE.--56 years (water years 1910-14, 1917-19, 1931-78), 1,957 ft<sup>3</sup>/s (55.42 m<sup>3</sup>/s), 11.31 in/yr (287 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum daily discharge, 14,950 ft<sup>3</sup>/s (423 m<sup>3</sup>/s) Mar. 25, 1913; minimum, 52 ft<sup>3</sup>/s (1.47 m<sup>3</sup>/s) Oct. 2, 1965, gage height, 5.31 ft (1.618 m), result of regulation during pipeline repair; minimum daily, 330 ft<sup>3</sup>/s (9.35 m<sup>3</sup>/s) Feb. 15, 1914.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 5,800 ft<sup>3</sup>/s (164 m<sup>3</sup>/s) Apr. 11, gage height, 10.20 ft (3.109 m); minimum, 637 ft<sup>3</sup>/s (18.0 m<sup>3</sup>/s) Aug. 10, gage height, 6.33 ft (1.929 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1760	1080	2860	2050	2140	2540	3000	1830	1560	1230	1030	1310
2	2580	1060	2570	2500	1880	2570	3700	1740	1610	1430	1040	1210
3	1670	1200	2550	2600	1400	1910	3920	1290	1190	1540	1030	1060
4	1410	1190	2530	1400	1900	1080	4390	1260	1050	1620	1030	1050
5	1320	2000	2530	1420	1900	1400	4720	1480	1050	1210	1030	1050
6	1220	1060	2530	1950	1900	2310	4950	1860	1040	1050	1030	1050
7	1210	1640	2530	1920	1900	2940	5440	1850	1140	1050	871	1000
8	1530	1300	2040	1900	1900	2690	5740	1860	1270	1060	652	1400
9	2180	1520	1110	1850	2000	2240	5730	1870	1260	1060	654	1040
10	1270	1880	1100	2100	2220	2270	5720	1870	1170	1060	647	1040
11	1260	1560	1100	3000	1900	2240	5760	1850	1030	1060	701	1050
12	1270	1170	1650	3000	2000	2080	5770	1340	1470	1060	790	1170
13	1200	1500	2360	3000	2000	1870	5610	2010	1580	1060	794	1840
14	1220	2520	2360	2200	2000	2460	4900	3450	1240	1060	798	2340
15	1270	2450	2450	1800	2000	2880	4230	3700	1300	1050	798	2470
16	1660	2240	2450	1780	1480	2280	3690	3600	1300	1050	934	2710
17	1860	1870	2450	1900	1900	1800	3670	2890	1210	1040	1040	2470
18	1500	1870	2440	1950	1400	1070	3400	3310	1420	1050	1400	2400
19	1600	1650	2500	1900	1850	1070	2810	2540	2000	1050	2660	2340
20	1330	1340	2600	1700	1850	1860	2520	1860	2200	1050	2480	2220
21	1080	1870	3000	1800	2020	2610	2400	1860	2200	1060	1100	2210
22	866	2520	3600	1820	2250	2280	2070	2020	2720	1050	1130	2210
23	1010	1880	3600	1820	2250	2280	1850	2260	2920	1040	1070	2270
24	1010	2040	3600	1950	2260	2280	1550	2260	1780	1040	1090	2200
25	1020	2280	3300	2200	2070	2410	1330	2250	1080	1040	1190	2220
26	1060	1880	2500	2300	1470	2430	1850	2180	1090	1050	1110	2050
27	1070	1320	1700	2300	2190	2270	1470	1610	1180	1040	1040	1540
28	1070	1340	1080	2320	2420	2240	2110	1320	1310	1040	1120	1320
29	1060	1560	1080	2300	---	2420	1840	1510	1460	1040	1200	1540
30	1060	2540	1080	2250	---	2580	1850	1840	1310	1040	1890	2000
31	1070	---	1060	2200	---	2910	---	1830	---	1030	1650	---
TOTAL	41696	52330	70400	66180	56750	64460	109100	64220	44290	34620	34999	52080
MEAN	1345	1744	2271	2135	2027	2208	3637	2072	1476	1117	1129	1735
MAX	2580	2540	3600	3000	2420	2990	5770	3700	2920	1840	2660	2710
MTN	866	1060	1060	1700	1850	1070	1330	1280	1030	1030	647	1000
CFSM	.57	.74	.97	.91	.86	.94	1.55	.88	.63	.48	.48	.74
IN.	.66	.83	1.11	1.05	.90	1.08	1.73	1.02	.70	.55	.55	.42

CAL YR 1977 TOTAL 598679 MEAN 1640 MAX 5130 MIN 619 CFSM .70 IN 9.48  
WTR YR 1978 TOTAL 695105 MEAN 1904 MAX 5770 MTN 647 CFSM .81 IN 11.00

## STREAMS TRIBUTARY TO LAKE MICHIGAN

04122030 MUSKEGON RIVER NEAR BRIDGETON, MI  
(National stream-quality accounting network station)

LOCATION.--Lat 43°19'05", long 86°02'11", in SW¼ NW¼ sec.30, T.11 N., R.14 W., Newago County, Hydrologic Unit 04060102, at bridge on Maple Island Road, 5 mi (8 km) southwest of Bridgeton, 13 mi (21 km) upstream from Muskegon Lake, and 20 mi (32 km) downstream from gaging station at Newago.

DRAINAGE AREA.--2,420 mi<sup>2</sup> (6,270 km<sup>2</sup>), approximately.

PERIOD OF RECORD.--Water years 1974 to current year.

PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE: November 1974 to current year.

WATER TEMPERATURES: November 1974 to current year.

INSTRUMENTATION.--Water-quality monitor since November 1975.

REMARKS.--In addition to water-quality monitor, samples were collected by a local observer on an approximate twice-weekly basis. Water-discharge measurements are made at times of monthly sampling. Interruptions in the record were due to malfunctions of the instrument.

EXTREMES FOR PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE: Maximum recorded (water years 1975-78), 637 micromhos Feb. 15, 1977; minimum (water years 1975-76, 1978), 108 micromhos Apr. 16, 1976.

WATER TEMPERATURES: Maximum, 33.0°C July 19, 1977; minimum, 0.0°C on many days during winter periods.

EXTREMES FOR CURRENT YEAR.--

SPECIFIC CONDUCTANCE: Maximum, 517 micromhos June 15; minimum, 137 micromhos Aug. 19.

WATER TEMPERATURES: Maximum, 26.0°C Aug. 14-16; minimum, 0.0°C on many days during winter period.

## WATER QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DATE	TIME	STREAM- FLOW- INSTAN- TANEOUS (CFS)	SPE- CIFIC CON- DUCT- ANCE (MICRO- MHOS)	PH (UNITS)	TEMPER- ATURE (DEG C)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION)	COLI- FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML)	STREP- TOCOCCI FECAL, KF AGAR (COLS./ 100 ML)	HARD- NESS (MG/L AS CAC03)	HARD- NESS, NONCAR- BONATE (MG/L CAC03)
OCT											
04...	1630	1140	386	8.4	15.5	9.9	99	--	--	200	14
NOV											
08...	1430	1340	399	8.3	13.0	9.2	88	--	34	190	35
DEC											
06...	1515	2510	385	8.3	2.0	12.5	92	>240	180	180	34
JAN											
11...	1450	1670	358	8.0	.0	--	--	K10	K25	170	31
FEB											
08...	1215	1640	400	8.0	.5	12.8	90	E12	K7	190	41
MAR											
08...	1330	2770	394	7.9	1.0	13.0	92	K18	K12	170	22
APR											
04...	1545	4520	331	7.9	3.0	12.2	92	K8	110	170	39
MAY											
02...	1215	1830	300	8.6	10.0	11.2	104	K13	K6	140	--
JUN											
06...	1445	1040	342	7.7	21.0	9.2	101	41	21	150	23
JUL											
19...	1330	1080	357	8.3	23.0	8.2	98	58	41	160	21
AUG											
15...	1100	810	350	8.3	23.0	8.2	98	K440	390	170	26
SEP											
12...	1345	1090	379	8.2	21.0	7.8	89	2500	170	160	21
DATE		CALCIUM DIS- SOLVED (MG/L AS CA)	MAGNE- SIUM, DIS- SOLVED (MG/L AS MG)	SODIUM, DIS- SOLVED (MG/L AS NA)	SODIUM AD- SORP- TION RATIO	POTAS- SIUM, DIS- SOLVED (MG/L AS K)	BICAR- BONATE (MG/L AS HC03)	CAR- BONATE (MG/L AS C03)	ALKA- LINITY (MG/L CAC03)	CARBON DIOXIDE DIS- SOLVED (MG/L AS C02)	SULFATE DIS- SOLVED (MG/L AS S04)
OCT											
04...	50	17	12	.4	12	1.3	180	20	181	1.1	25
NOV											
08...	50	16	12	.4	12	1.3	190	0	156	1.5	26
DEC											
06...	48	15	11	.4	12	1.3	180	0	150	1.4	25
JAN											
11...	46	14	9.6	.3	11	1.3	170	0	139	2.7	23
FEB											
08...	51	15	11	.3	11	1.3	180	0	150	2.9	29
MAR											
08...	45	14	11	.4	12	1.4	180	0	148	3.6	26
APR											
04...	45	13	10	.3	12	1.4	160	0	131	3.2	24
MAY											
02...	37	11	8.1	.3	11	1.4	--	--	--	--	21
JUN											
06...	42	12	9.1	.3	11	1.3	160	0	130	5.1	22
JUL											
19...	43	12	9.7	.3	12	1.2	170	0	139	1.4	22
AUG											
15...	43	14	11	.4	13	1.3	170	0	139	1.4	23
SEP											
12...	42	14	11	.4	13	1.1	170	0	139	1.7	24

K--Results based on colony count outside the acceptable range (non-ideal colony count)

## STREAMS TRIBUTARY TO LAKE MICHIGAN

04122030 MUSKEGON RIVER NEAR BRIDGETON, MI--CONTINUED

## WATER-QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978--CONTINUED

DATE	CHLORIDE, DIS- SOLVED (MG/L AS CL)	FLUORIDE, DIS- SOLVED (MG/L AS F)	SILICA, DIS- SOLVED (MG/L AS SiO2)	SOLIDS, RESIDUE AT 180 DEG. C DIS- SOLVED (MG/L)	SOLIDS, SUM OF CONSTITUENTS, DIS- SOLVED (MG/L)	SOLIDS, DIS- SOLVED (TONS PER DAY)	NITRO- GEN, NO2+NO3 TOTAL (MG/L AS N)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N)	NITRO- GEN, ORGANIC TOTAL (MG/L AS N)	NITRO- GEN,AM- MONIA + ORGANIC TOTAL (MG/L AS N)
OCT 04...	18	.1	5.1	230	237	708	.34	.05	--	--
NOV 08...	21	.1	3.2	231	223	836	.15	.04	--	--
DEC 06...	18	.1	3.8	229	211	1550	.28	.02	--	--
JAN 11...	16	.1	6.5	194	200	875	.40	.01	--	--
FEB 08...	21	.1	8.0	241	225	1070	.53	.01	.38	.39
MAR 08...	17	.1	9.2	228	212	1710	.41	.00	.39	.39
APR 04...	22	.1	7.8	195	202	2380	.53	.05	.57	.62
MAY 02...	16	.1	4.5	176	--	870	.30	.05	.56	.61
JUN 06...	17	.1	3.4	215	186	604	.19	.04	.52	.56
JUL 19...	17	.1	4.5	232	193	677	.14	.03	.39	.42
AUG 15...	20	.1	4.2	215	200	470	.04	.04	.54	.58
SEP 12...	20	.1	5.6	214	202	630	.05	.05	.42	.47

DATE	NITRO- GEN, NH4 + ORG. SUSP. TOTAL (MG/L AS N)	NITRO- GEN, AM- MONIA + ORGANIC DIS. (MG/L AS N)	NITRO- GEN, TOTAL (MG/L AS N)	NITRO- GEN, TOTAL (MG/L AS NO3)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, DIS- SOLVED (MG/L AS P)	CARBON, ORGANIC TOTAL (MG/L AS C)	SEDI- MENT, SUS- PENDED (MG/L)	SEDI- MENT DIS- CHARGE, SUS- PENDED (T/DAY)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM
OCT 04...	--	.23	--	--	.04	.01	--	16	49	100
NOV 08...	--	.26	--	--	.02	.01	--	10	36	100
DEC 06...	--	.25	--	--	.02	.01	8.4	20	136	100
JAN 11...	--	.22	--	--	.01	.00	--	4	18	100
FEB 08...	.00	--	.92	4.1	.01	.00	6.6	4	18	100
MAR 08...	.00	.39	.80	3.5	.02	.01	1.5	36	269	100
APR 04...	.14	.48	1.2	5.1	.03	.00	--	59	720	100
MAY 02...	.09	.52	.91	4.0	.03	.01	10	22	109	100
JUN 06...	.21	.35	.75	3.3	.02	.01	8.5	5	14	100
JUL 19...	.00	--	.56	2.5	.02	.00	--	10	29	100
AUG 15...	.25	.33	.62	2.7	.03	.00	5.9	8	17	100
SEP 12...	.19	.28	.52	2.3	.03	.01	5.8	4	12	100



## STREAMS TRIBUTARY TO LAKE MICHIGAN

04122030 MUSKEGON RIVER NEAR BRIDGETON, MI--CONTINUED

WATER-QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978--CONTINUED

DATE	TIME	ARSENIC TOTAL (UG/L AS AS)	ARSENIC DIS- SOLVED (UG/L AS AS)	BARIUM, TOTAL RECOV- ERABLE (UG/L AS BA)	BARIUM, DIS- SOLVED (UG/L AS BA)	CADMIUM TOTAL RECOV- ERABLE (UG/L AS CO)	CADMIUM DIS- SOLVED (UG/L AS CO)	CHRO- MIUM, TOTAL RECOV- ERABLE (UG/L AS CR)	CHRO- MIUM, DIS- SOLVED (UG/L AS CR)	COBALT, TOTAL RECOV- ERABLE (UG/L AS CO)
OCT 04...	1630	1	1	0	0	0	0	<10	2	0
JAN 11...	1450	0	0	0	0	1	1	<10	0	0
APR 04...	1545	1	1	0	0	1	--	10	0	0
JUL 19...	1330	1	1	0	0	0	0	10	0	0

DATE	COBALT, DIS- SOLVED (UG/L AS CO)	COPPER, TOTAL RECOV- ERABLE (UG/L AS CU)	COPPER, DIS- SOLVED (UG/L AS CU)	IRON, TOTAL RECOV- ERABLE (UG/L AS FE)	IRON, DIS- SOLVED (UG/L AS FE)	LEAD, TOTAL RECOV- ERABLE (UG/L AS PB)	LEAD, DIS- SOLVED (UG/L AS PB)	MANGA- NESE, TOTAL RECOV- ERABLE (UG/L AS MN)	MANGA- NESE, DIS- SOLVED (UG/L AS MN)
OCT 04...	0	5	1	290	10	--	9	70	10
JAN 11...	0	5	2	180	40	31	8	30	20
APR 04...	--	9	1	570	80	10	0	40	10
JUL 19...	0	3	2	90	30	1	0	40	0

DATE	MERCURY TOTAL RECOV- ERABLE (UG/L AS HG)	MERCURY DIS- SOLVED (UG/L AS HG)	SELE- NIUM, TOTAL (UG/L AS SE)	SELE- NIUM, DIS- SOLVED (UG/L AS SE)	SILVER, TOTAL RECOV- ERABLE (UG/L AS AG)	SILVER, DIS- SOLVED (UG/L AS AG)	ZINC, TOTAL RECOV- ERABLE (UG/L AS ZN)	ZINC, DIS- SOLVED (UG/L AS ZN)	CARBON, ORGANIC DIS- SOLVED (UG/L AS C)
OCT 04...	<.5	<.5	0	0	0	0	10	10	9.2
JAN 11...	<.5	<.5	0	0	0	0	20	20	4.0
APR 04...	<.5	<.5	0	0	0	0	10	0	4.6
JUL 19...	.5	.5	0	0	0	0	20	0	6.6

QUALITATIVE AND ASSOCIATED QUANTITATIVE ANALYSES OF BIOLOGICAL DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
PERIPHYTON

DATE	TIME	LENGTH OF EXPO- SURE (DAYS)	PERI- PHYTON BIOMASS ASH WEIGHT G/SQ M	PERI- PHYTON BIOMASS TOTAL DRY WEIGHT G/SQ M	CHLOR-A PERI- PHYTON TOTAL CHROMO- GRAPHIC FLUOROM (MG/M2)	CHLOR-B PERI- PHYTON TOTAL CHROMO- GRAPHIC FLUOROM (MG/M2)
AUG 15...	1100	27	2.99	4.41	4.34	1.28

04122030 MUSKEGON RIVER NEAR BRIDGETON, MI--CONTINUED

## SPECIFIC CONDUCTANCE (MICROMHOS/CM AT 25 DEG. C), WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
OCTOBER			NOVEMBER			DECEMBER			JANUARY			
1	273	241	255	399	281	353	326	229	249	378	361	371
2	320	260	281	406	285	361	384	329	351	394	370	381
3	354	303	322	406	386	397	396	379	386	394	340	377
4	406	321	360	410	395	403	405	379	392	396	360	381
5	405	396	401	403	382	391	399	379	386	391	363	377
6	409	402	404	409	384	398	394	378	387	383	361	374
7	410	326	395	404	386	395	395	380	387	383	290	348
8	394	300	343	405	389	396	401	379	388	380	256	313
9	391	382	386	397	302	373	402	390	396	388	373	381
10	410	382	396	397	331	379	398	383	394	389	367	383
11	412	366	391	382	360	371	398	376	393	383	333	358
12	409	400	404	392	384	389	372	271	327	367	342	350
13	411	406	409	397	388	392	339	233	279	363	340	348
14	414	409	412	398	386	393	247	230	237	369	349	358
15	411	402	407	407	365	384	276	242	253	385	367	379
16	405	378	388	396	373	382	379	243	329	381	371	376
17	394	382	389	391	378	384	360	261	288	381	366	374
18	411	391	401	388	379	383	374	222	261	381	367	374
19	402	384	395	391	379	386	239	222	230	377	365	370
20	407	382	391	362	267	294	320	223	245	376	364	371
21	408	398	395	401	374	394	362	276	330	380	368	374
22	---	---	---	398	382	390	354	259	315	385	369	377
23	390	374	379	401	264	338	366	290	317	382	369	376
24	390	377	381	379	261	303	369	334	350	383	363	372
25	390	381	385	383	367	375	374	359	365	376	354	365
26	391	380	385	395	373	384	368	328	343	371	344	358
27	389	379	383	398	386	392	353	317	332	376	352	366
28	397	383	391	390	380	385	334	325	329	372	300	349
29	392	380	385	401	315	380	349	302	332	364	333	350
30	395	383	387	396	235	365	362	283	338	370	342	356
31	394	326	379	---	---	---	375	347	367	374	349	360
MONTH				410	235	377	405	222	331	396	256	366

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
FEBRUARY			MARCH			APRIL			MAY			
1	378	343	362	401	371	384	350	339	342	---	---	---
2	380	347	368	405	373	388	348	342	345	307	296	301
3	386	358	376	399	373	388	---	---	---	332	301	313
4	383	358	376	403	394	398	---	---	---	327	307	311
5	375	365	370	410	394	401	382	311	351	342	277	312
6	384	365	378	400	387	393	380	277	307	344	317	332
7	385	374	382	409	374	391	382	292	327	339	291	315
8	388	373	343	414	375	392	387	377	383	317	215	257
9	388	372	379	421	387	402	386	321	356	323	292	307
10	391	374	381	417	383	398	368	304	340	321	285	300
11	392	364	377	407	375	390	337	289	308	333	291	307
12	393	372	383	390	341	374	351	321	332	317	224	255
13	384	363	376	400	244	379	354	334	343	260	224	240
14	399	368	380	233	214	221	361	333	347	267	238	252
15	388	362	373	312	225	262	373	332	356	306	249	275
16	383	360	371	369	314	341	382	331	359	329	270	294
17	393	367	379	374	322	355	382	343	363	325	280	297
18	394	368	379	389	366	376	371	303	351	341	283	304
19	399	382	393	393	364	375	---	---	---	313	289	300
20	398	376	388	387	362	380	---	---	---	334	302	315
21	397	377	387	349	258	314	---	---	---	328	307	317
22	394	375	386	351	216	295	---	---	---	331	309	319
23	396	372	383	370	251	321	---	---	---	318	300	310
24	369	369	376	369	355	361	---	---	---	335	306	320
25	387	365	376	371	339	357	---	---	---	324	302	312
26	401	378	388	360	257	331	---	---	---	329	305	315
27	400	380	391	356	331	364	---	---	---	338	306	321
28	393	370	381	353	333	346	---	---	---	348	321	336
29	---	---	---	359	345	350	---	---	---	347	328	337
30	---	---	---	358	345	339	---	---	---	342	308	327
31	---	---	---	343	254	313	---	---	---	344	307	327
MONTH	401	343	378	421	214	357						

## STREAMS TRIBUTARY TO LAKE MICHIGAN

04122030 MUSKEGON RIVER NEAR BRIDGETON, MI--CONTINUED

SPECIFIC CONDUCTANCE (MICROMHOS/CM AT 25 DEG. C), WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
	JUNE			JULY			AUGUST			SEPTEMBER		
1	342	315	331	289	206	244	343	332	337	288	249	273
2	348	316	331	246	214	235	351	315	336	296	270	280
3	---	---	---	262	240	246	333	316	326	353	284	325
4	---	---	---	368	265	315	342	327	336	354	322	337
5	---	---	---	346	295	320	353	331	342	360	308	345
6	319	296	309	332	309	316	362	333	346	370	356	363
7	315	244	298	330	292	310	350	334	343	381	362	371
8	313	258	296	297	290	293	366	336	354	384	358	371
9	340	315	326	303	294	299	365	340	355	378	355	367
10	390	342	367	344	298	316	353	335	342	384	370	378
11	466	375	416	333	292	312	367	338	355	383	362	376
12	494	346	435	288	278	282	370	363	366	372	306	359
13	468	331	381	294	280	286	365	353	361	361	296	318
14	492	330	418	367	279	308	362	347	356	320	267	295
15	517	461	491	405	366	387	359	347	354	377	296	331
16	504	348	429	406	349	381	316	265	298	385	369	377
17	425	238	359	359	323	337	340	299	317	383	324	354
18	418	237	320	352	314	331	343	312	328	378	297	334
19	447	303	354	340	313	326	329	137	211	381	368	374
20	340	276	316	330	285	320	316	252	286	370	355	365
21	337	306	317	320	285	312	343	283	310	376	353	365
22	319	263	287	318	292	308	330	246	289	391	346	372
23	293	265	277	328	311	321	339	298	325	389	358	379
24	298	262	278	335	312	323	334	324	327	394	368	385
25	292	257	274	334	314	324	331	318	323	390	382	387
26	266	194	227	330	303	322	329	319	325	391	378	385
27	273	253	265	331	296	320	335	224	263	393	389	391
28	295	267	278	335	321	329	269	225	241	399	386	391
29	292	276	283	337	319	327	272	247	259	397	385	392
30	293	283	289	335	317	327	286	252	268	389	350	376
31	---	---	---	344	328	337	289	252	269	---	---	---
MONTH				406	206	313	370	137	318	399	249	357

## TEMPERATURE (DEG. C) OF WATER, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
	OCTOBER			NOVEMBER			DECEMBER			JANUARY		
1	15.5	14.5	15.0	13.0	11.5	12.0	4.0	3.0	3.5	.0	.0	.0
2	16.0	14.5	15.0	13.5	11.5	12.5	4.0	3.0	3.5	.0	.0	.0
3	15.5	14.5	15.0	13.5	13.0	13.0	4.0	2.5	3.5	.0	.0	.0
4	16.0	14.5	15.0	13.0	11.5	12.5	3.0	2.0	2.5	.0	.0	.0
5	15.5	14.5	15.0	11.5	10.0	11.0	3.5	2.0	3.0	.0	.0	.0
6	14.0	13.0	13.5	12.0	11.5	11.5	3.0	2.0	2.5	1.0	.0	.5
7	13.0	12.0	12.5	12.5	12.0	12.0	2.5	1.5	2.0	1.5	1.0	1.0
8	13.5	12.0	12.5	13.0	12.5	12.5	2.0	1.0	1.5	1.0	.0	1.0
9	13.0	12.5	13.0	13.0	12.0	12.5	1.0	.0	.0	.0	.0	.0
10	13.5	12.0	15.0	12.0	8.5	10.5	.0	.0	.0	.0	.0	.0
11	13.0	11.0	12.0	8.5	8.0	8.5	.0	.0	.0	.0	.0	.0
12	11.5	10.5	11.0	8.0	6.0	7.0	1.0	.0	.5	.0	.0	.0
13	12.0	10.0	11.0	7.0	6.0	6.5	2.5	1.5	2.0	.0	.0	.0
14	12.0	10.0	11.0	8.0	6.5	7.0	2.5	2.0	2.5	.0	.0	.0
15	12.0	11.0	11.5	8.0	7.0	7.5	2.5	2.0	2.0	.0	.0	.0
16	11.0	10.0	10.5	8.0	7.5	8.0	3.5	2.0	2.5	.0	.0	.0
17	10.5	9.5	10.0	7.5	6.0	6.5	3.0	2.0	2.5	.0	.0	.0
18	11.5	10.5	11.0	6.0	6.0	6.0	2.5	2.0	2.5	.0	.0	.0
19	11.5	10.5	11.0	6.5	5.5	6.0	3.0	2.0	2.5	.0	.0	.0
20	12.0	10.0	11.0	7.0	6.0	6.0	3.0	2.0	2.5	.0	.0	.0
21	12.0	10.5	11.0	7.0	4.5	6.0	1.5	1.5	1.5	.0	.0	.0
22	12.0	10.0	11.5	5.5	4.5	5.5	1.5	1.0	1.5	.0	.0	.0
23	11.5	10.5	11.0	5.0	4.5	5.0	2.0	1.0	1.5	.0	.0	.0
24	12.5	10.5	11.5	5.0	4.5	5.0	1.5	1.0	1.5	.0	.0	.0
25	13.5	10.5	13.0	5.0	4.0	4.5	1.5	.0	.5	.0	.0	.0
26	13.5	12.0	13.0	4.0	3.0	3.5	.0	.0	.0	.0	.0	.0
27	12.5	11.5	12.0	2.5	1.5	2.0	.0	.0	.0	.0	.0	.0
28	12.5	10.5	11.5	2.5	1.5	2.0	.0	.0	.0	.0	.0	.0
29	12.0	10.5	11.0	3.5	2.0	2.5	.0	.0	.0	.0	.0	.0
30	12.0	10.5	11.0	3.5	2.0	2.5	.0	.0	.0	.0	.0	.0
31	11.5	10.0	11.0	---	---	---	.0	.0	.0	.5	.0	.0
MONTH	16.0	9.5	12.0	13.5	1.5	7.5	4.0	.0	1.5	1.5	.0	.0

04122030 MUSKEGON RIVER NEAR BRIDGETON, MI--CONTINUED

## TEMPERATURE (DEG. C) OF WATER, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
FEBRUARY			MARCH			APRIL			MAY			
1	.5	.0	.0	1.0	.0	.5	7.0	5.0	6.0	---	---	---
2	.5	.0	.0	.5	.0	.0	5.0	3.0	3.5	11.5	10.5	11.0
3	.5	.0	.0	.5	.0	.5	4.5	3.0	3.5	13.5	10.5	11.5
4	.5	.0	.0	1.0	.0	.0	4.5	1.5	3.5	11.5	10.0	11.0
5	.5	.0	.5	.0	.0	.0	2.0	.5	1.0	12.5	9.5	11.0
6	.5	.0	.0	1.5	.0	.5	4.5	1.0	4.0	12.5	9.5	10.5
7	.5	.0	.0	.5	.0	.5	4.0	2.0	3.0	11.5	11.0	11.0
8	.5	.0	.0	1.0	.0	.5	2.5	1.0	1.5	14.0	10.5	12.5
9	.5	.0	.0	1.0	.0	.5	5.0	1.5	3.0	11.0	9.5	10.5
10	.5	.0	.0	2.0	.5	1.0	5.5	3.0	3.5	13.0	9.5	11.0
11	.5	.0	.0	2.0	1.0	1.5	5.5	3.5	5.0	12.5	11.0	12.0
12	.5	.0	.0	3.0	1.0	2.0	4.5	2.5	3.5	14.5	11.0	13.5
13	.5	.0	.0	3.0	2.0	2.5	4.0	2.5	3.0	15.5	13.0	14.5
14	.5	.0	.0	2.5	1.0	2.0	4.0	2.5	3.5	14.5	12.0	13.0
15	.0	.0	.0	1.5	.5	1.0	4.5	3.0	3.5	12.5	11.5	12.0
16	.0	.0	.0	2.0	1.5	2.0	5.5	3.0	4.0	12.5	10.5	11.5
17	.0	.0	.0	2.0	1.0	1.5	6.0	3.5	5.0	13.0	10.5	11.5
18	.0	.0	.0	2.0	.5	1.5	6.5	4.0	5.0	14.0	12.0	13.0
19	.0	.0	.0	5.0	1.0	3.0	---	---	---	14.5	13.0	13.5
20	.0	.0	.0	5.0	2.5	3.5	---	---	---	15.0	13.5	14.5
21	.0	.0	.0	3.0	2.0	2.5	---	---	---	15.0	13.0	13.5
22	.0	.0	.0	2.5	1.5	2.0	---	---	---	15.0	14.0	14.5
23	.0	.0	.0	4.5	1.5	3.0	---	---	---	15.0	13.5	14.5
24	.0	.0	.0	3.5	2.0	2.5	---	---	---	16.0	14.5	15.5
25	.0	.0	.0	2.5	1.5	2.0	---	---	---	16.5	15.0	15.5
26	.0	.0	.0	2.5	1.5	2.0	---	---	---	16.5	15.5	16.0
27	.5	.0	.0	5.0	2.5	3.5	---	---	---	17.0	16.5	17.0
28	1.0	.0	.5	5.0	3.5	4.5	---	---	---	20.0	17.0	18.5
29	---	---	---	4.5	3.0	3.5	---	---	---	20.0	17.5	18.5
30	---	---	---	4.0	3.0	3.0	---	---	---	18.0	16.5	17.5
31	---	---	---	7.0	3.5	5.0	---	---	---	18.0	17.0	17.5
MONTH	1.0	.0	.0	7.0	.0	2.0						

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
JUNE			JULY			AUGUST			SEPTEMBER			
1	19.0	17.5	18.0	23.0	20.5	22.0	23.5	19.5	21.5	21.5	19.0	20.0
2	18.0	16.0	17.5	21.5	20.0	20.5	22.0	20.5	21.0	21.0	19.0	20.0
3	---	---	---	22.5	20.0	21.0	22.5	19.5	21.0	21.5	19.5	20.0
4	---	---	---	22.5	21.0	21.5	22.5	19.0	21.0	20.5	18.0	19.0
5	---	---	---	22.5	20.5	21.5	22.5	18.5	20.5	21.0	18.0	19.5
6	22.0	19.0	21.0	24.0	20.5	22.0	23.5	18.5	21.0	20.0	18.0	19.0
7	22.0	19.0	20.0	23.5	21.5	22.5	23.0	20.0	21.5	20.5	18.0	19.0
8	20.5	18.0	19.0	22.5	20.5	21.5	24.0	19.5	21.5	20.5	18.5	19.5
9	21.5	18.0	19.0	23.5	19.5	21.5	25.5	22.0	23.5	20.0	18.5	19.5
10	21.5	18.0	19.5	23.0	20.5	21.5	24.0	20.5	22.5	20.5	17.5	19.0
11	23.0	18.5	20.5	22.5	19.0	20.5	23.0	20.5	22.0	20.5	18.5	19.5
12	23.0	18.5	21.5	22.5	18.5	21.0	25.0	21.0	23.0	21.0	18.0	19.5
13	19.5	17.0	18.0	22.5	20.5	21.5	25.5	21.5	23.5	18.5	17.0	17.5
14	18.0	16.5	17.5	23.0	19.5	21.0	26.0	22.0	24.0	20.0	18.0	19.0
15	20.0	16.5	18.0	24.0	21.0	22.5	26.0	22.5	24.0	19.5	18.5	19.0
16	21.5	18.5	19.5	24.0	20.5	22.0	26.0	22.5	24.0	19.0	18.5	18.5
17	22.0	18.5	20.5	23.0	20.5	22.0	23.0	20.5	22.0	20.0	18.5	19.5
18	22.5	21.0	22.0	22.0	20.5	21.5	23.5	21.5	22.5	20.0	19.0	19.5
19	22.5	21.5	22.0	22.5	20.5	21.5	23.0	22.0	22.5	19.0	18.5	19.0
20	22.0	21.0	21.5	23.0	20.5	22.0	23.0	22.0	22.5	20.0	19.0	19.5
21	22.0	19.0	20.5	24.5	23.0	23.5	24.0	20.5	22.5	20.0	17.0	18.5
22	20.0	18.5	19.0	25.0	22.5	23.5	24.5	20.5	22.5	18.0	17.0	17.5
23	19.0	17.5	18.0	24.0	21.5	22.5	23.5	22.0	22.5	17.5	16.0	17.0
24	20.5	18.0	19.0	23.5	19.5	21.5	23.5	21.5	22.5	17.5	16.5	17.0
25	22.5	19.5	21.0	23.5	21.0	22.5	22.0	20.5	22.0	17.5	16.5	17.0
26	23.0	20.5	22.5	22.5	20.0	22.0	21.5	20.5	21.0	17.0	15.5	16.5
27	24.5	22.5	23.0	23.0	19.5	21.5	21.5	20.0	20.5	16.5	15.5	16.0
28	24.5	22.5	23.0	23.0	20.0	21.5	22.0	19.5	20.5	16.0	14.0	15.0
29	24.5	21.5	23.0	22.5	20.0	21.5	22.0	19.5	21.0	15.5	14.5	15.0
30	23.0	21.5	22.0	21.5	18.0	20.0	21.5	19.0	20.5	16.5	15.0	16.0
31	---	---	---	22.5	19.0	20.5	21.5	19.5	20.0	---	---	---
MONTH				25.0	18.0	21.5	26.0	18.5	22.0	21.5	14.0	18.5

## STREAMS TRIBUTARY TO LAKE MICHIGAN

04122100 BEAR CREEK NEAR MUSKEGON, MI

LOCATION.--Lat 43°17'19", long 86°13'22", in SW¼ NW¼ sec.4, T.10 N., R.16 W., Muskegon County, Hydrologic Unit 04060102, on left bank at upstream side of bridge on North Getty Street, 1.5 mi (2.4 km) upstream from Little Bear Creek, and 3.9 mi (6.3 km) northeast of Muskegon.

DRAINAGE AREA.--14.8 mi<sup>2</sup> (38.3 km<sup>2</sup>).

PERIOD OF RECORD.--October 1965 to current year.

GAGE.--Water-stage recorder. Datum of gage is 590.00 ft (179.832 m), correction, Michigan Department of Natural Resources datum. Prior to Mar. 17, 1978, at different datum.

REMARKS.--Records good except those for the winter period, which are poor. Some regulation during low flow, by dams and irrigation above station. Several observations of water temperature were made during the year.

AVERAGE DISCHARGE.--13 years, 15.6 ft<sup>3</sup>/s (0.442 m<sup>3</sup>/s), 14.31 in/yr (363 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,200 ft<sup>3</sup>/s (34.0 m<sup>3</sup>/s) Mar. 5, 1976, gage height, 11.00 ft (3.353 m) datum then in use; minimum, 1.0 ft<sup>3</sup>/s (0.028 m<sup>3</sup>/s) Aug. 5, 17, 22, 1971.

EXTREMES FOR CURRENT YEAR.--Peak discharge above base of 100 ft<sup>3</sup>/s (2.83 m<sup>3</sup>/s) and maximum (\*):

Date	Time	Discharge (ft <sup>3</sup> /s) (m <sup>3</sup> /s)	Gage height (ft) (m)	Date	Time	Discharge (ft <sup>3</sup> /s) (m <sup>3</sup> /s)	Gage height (ft) (m)
Mar. 24	0500	107 3.03	13.83 4.215	May 13	2100	126 3.57	14.23 4.337
Apr. 7	0300	103 2.92	13.72 4.182	Aug. 19	1500	*170 4.81	*15.11 4.606

Minimum discharge, 2.7 ft<sup>3</sup>/s (0.076 m<sup>3</sup>/s) Aug. 15, gage height, 10.17 ft (3.100 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	20	12	28	13	13	14	49	10	8.8	14	3.9	10
2	12	18	38	13	13	14	31	10	8.6	18	3.7	8.8
3	8.6	14	21	12	13	14	27	9.7	8.1	13	4.5	8.8
4	6.8	12	16	12	13	15	38	9.6	7.8	9.8	3.6	8.2
5	6.5	10	14	12	13	15	34	11	8.8	8.5	3.8	8.0
6	5.8	9.3	13	12	13	15	48	12	7.7	7.7	3.4	5.9
7	5.3	8.9	12	12	13	15	80	11	7.7	7.1	3.3	7.0
8	15	8.7	11	12	13	15	39	13	8.8	7.2	3.4	6.5
9	18	9.3	13	12	13	15	37	14	7.8	6.7	3.5	6.4
10	12	20	17	12	13	16	57	12	6.7	7.0	3.2	5.5
11	18	21	16	12	13	17	72	11	6.7	5.9	3.0	6.4
12	17	16	18	11	13	20	43	17	8.8	5.4	3.4	11
13	14	14	22	11	13	26	30	69	7.7	6.1	3.3	16
14	11	12	28	11	13	29	24	81	6.9	5.3	3.1	39
15	10	12	28	11	13	30	21	41	7.6	5.4	2.8	69
16	9.1	12	30	11	13	27	19	28	9.8	4.5	12	31
17	8.7	11	39	11	13	25	18	23	13	4.6	5.8	24
18	10	12	41	11	13	23	18	19	46	4.7	4.9	37
19	11	11	38	11	13	22	19	17	26	4.5	113	30
20	9.7	17	39	11	13	31	19	17	16	5.2	78	22
21	9.0	18	50	12	13	45	20	18	13	6.4	27	20
22	9.0	13	33	12	13	49	16	15	11	5.7	17	17
23	8.5	12	26	12	13	69	16	13	9.7	5.1	13	15
24	8.6	13	23	12	13	85	18	13	8.8	4.5	13	14
25	8.7	13	22	12	13	39	16	11	9.2	4.0	12	13
26	9.1	12	21	12	13	26	14	11	23	4.3	11	12
27	8.5	11	20	12	13	27	13	11	18	5.3	19	12
28	7.9	9.9	19	12	13	48	12	9.9	12	4.3	37	13
29	7.6	9.6	17	12	---	58	12	9.0	10	4.3	24	12
30	7.7	9.6	15	12	---	36	11	10	8.9	4.2	15	15
31	7.7	---	13	12	---	37	---	9.4	---	3.7	12	---
TOTAL	320.8	381.3	741	365	364	917	871	565.6	352.9	202.4	465.6	505.5
MEAN	10.3	12.7	23.9	11.8	13.0	29.6	29.0	18.2	11.8	6.53	15.0	16.9
MAX	20	21	50	13	13	85	80	81	46	18	113	69
MIN	5.3	8.7	11	11	13	14	11	9.0	6.7	3.7	2.8	6.4
CFSM	.70	.86	1.62	.80	.88	2.00	1.96	1.23	.80	.44	1.01	1.14
IN.	.81	.96	1.86	.92	.91	2.30	2.19	1.42	.89	.51	1.17	1.27

CAL YR 1977	TOTAL	4079.6	MEAN	11.2	MAX	79	MIN	2.2	CFSM	.76	IN	10.25
WTR YR 1978	TOTAL	6052.1	MEAN	16.6	MAX	113	MIN	2.8	CFSM	1.12	IN	15.21



## STREAMS TRIBUTARY TO LAKE MICHIGAN

221

## 04122200 WHITE RIVER NEAR WHITEHALL, MI

LOCATION.--Lat 43°27'51", long 86°13'57", in SE¼ NW¼ sec.4, T.12 N., R.16 W., Muskegon County, Hydrologic Unit 04060101, on right bank 30 ft (9 m) downstream from bridge on Fruitvale Road, 6.3 mi (10.1 km) downstream from North Branch, and 6.9 mi (11.1 km) northeast of Whitehall.

DRAINAGE AREA.--380 mi<sup>2</sup> (980 km<sup>2</sup>), approximately.

PERIOD OF RECORD.--August 1957 to current year.

GAGE.--Water-stage recorder. Datum of gage is 594.1 ft (181.1 m) National Geodetic Vertical Datum of 1929. Nov. 18, 1957, to Oct. 22, 1958, nonrecording gage at same site and datum.

REMARKS.--Record good except those for the winter period, which are poor. Some regulation during low flows by dams above station. Several observations of water temperature were made during the year.

AVERAGE DISCHARGE.--21 years, 421 ft<sup>3</sup>/s (11.92 m<sup>3</sup>/s), 15.05 in/yr (382 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 5,400 ft<sup>3</sup>/s (153 m<sup>3</sup>/s) Sept. 1, 1975, gage height, 7.46 ft (2.274 m); minimum, 163 ft<sup>3</sup>/s (4.62 m<sup>3</sup>/s) Aug. 18, 19, 1958.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 1,220 ft<sup>3</sup>/s (34.6 m<sup>3</sup>/s) Apr. 2, 8, gage height, 4.93 ft (1.503 m); minimum, 228 ft<sup>3</sup>/s (6.46 m<sup>3</sup>/s) Aug. 15, gage height, 1.54 ft (0.469 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	389	363	502	520	420	390	838	408	355	309	254	474
2	436	401	548	500	410	390	1190	401	344	336	258	311
3	473	447	712	480	410	390	1090	394	333	338	274	336
4	443	464	712	470	400	390	952	386	334	319	268	322
5	408	444	602	460	400	390	1010	387	335	302	257	312
6	376	425	540	450	400	390	1030	397	336	294	249	315
7	354	404	500	440	400	390	1070	398	329	287	245	298
8	368	389	480	430	400	400	1170	397	328	282	243	291
9	407	382	500	430	400	410	1030	405	333	279	242	288
10	466	403	540	430	390	420	975	414	324	279	245	286
11	489	486	600	430	390	430	1010	407	315	276	239	284
12	495	594	665	430	390	440	1010	411	309	271	238	317
13	535	588	729	420	390	460	901	482	309	269	235	349
14	535	529	771	420	390	470	798	725	311	271	234	404
15	498	481	793	420	390	476	727	1060	311	268	229	447
16	454	462	768	420	390	485	670	941	314	262	283	642
17	420	462	603	420	390	475	613	841	331	256	319	647
18	403	458	621	420	390	454	570	771	402	255	308	524
19	397	444	719	420	390	439	542	663	492	255	319	441
20	393	444	827	420	390	451	537	565	521	257	817	474
21	386	465	879	420	390	469	538	500	443	271	904	478
22	377	511	910	420	390	510	537	467	384	276	655	578
23	372	506	822	420	390	554	522	441	345	269	454	518
24	366	487	736	420	390	612	506	419	327	259	359	442
25	364	472	685	420	390	641	494	403	322	253	340	391
26	365	453	671	420	390	596	479	390	325	252	326	346
27	363	426	670	420	390	546	458	379	334	282	339	344
28	358	449	630	420	390	530	440	367	325	299	446	358
29	356	470	600	420	---	649	426	359	312	275	644	349
30	352	490	570	420	---	788	416	365	301	267	715	347
31	353	---	540	420	---	742	---	364	---	261	549	---
TOTAL	12751	13804	20445	13450	11050	15177	22551	15308	10385	8629	11687	12053
MEAN	411	460	660	434	395	490	752	494	346	278	377	402
MAX	535	594	910	520	420	788	1190	1060	521	338	904	642
MIN	352	363	480	420	390	390	410	359	301	252	229	284
CFSM	1.08	1.21	1.74	1.14	1.04	1.29	1.98	1.30	.91	.73	.99	1.06
IN.	1.25	1.35	2.00	1.32	1.08	1.49	2.21	1.50	1.02	.84	1.14	1.18

CAL YR 1977 TOTAL 148512 MEAN 407 MAX 1390 MIN 228 CFSM 1.07 IN 14.54  
WTR YR 1978 TOTAL 167290 MEAN 458 MAX 1190 MIN 229 CFSM 1.21 IN 16.38

## STREAMS TRIBUTARY TO LAKE MICHIGAN

04122500 PERE MARQUETTE RIVER AT SCOTTVILLE, MI

LOCATION.--Lat 43°56'42", long 86°16'43", in NW¼ NW¼ sec.19, T.18 N., R.16 W., Mason County, Hydrologic Unit 04060101, on right bank 20 ft (6 m) upstream from highway bridge at south edge of Scottville, 1.4 mi (2.3 km) upstream from India Creek and 5.6 mi (9.0 km) downstream from Big South Branch.

DRAINAGE AREA.--709 mi<sup>2</sup> (1,836 km<sup>2</sup>).

## WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--August 1939 to current year. Prior to October 1942, published as "at Custer".

REVISED RECORDS.--WSP 1437: 1941(M), 1943(M), 1949(M), 1950.

GAGE.--Water-stage recorder. Datum of gage is 597.66 ft (182.167 m) National Geodetic Vertical Datum of 1929. Prior to June 12, 1943, nonrecording gage at bridge 4.5 mi (7.2 km) upstream at different datum.

REMARKS.--Water-discharge records good except those for the winter period, which are poor. Some regulation at low flow.

AVERAGE DISCHARGE.--39 years, 654 ft<sup>3</sup>/s (18.52 m<sup>3</sup>/s), 12.53 in/yr (318 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 2,970 ft<sup>3</sup>/s (84.1 m<sup>3</sup>/s) July 1, 1969, gage height, 6.26 ft (1.908 m); minimum, 209 ft<sup>3</sup>/s (5.92 m<sup>3</sup>/s) Dec. 11, 1962, discharge measurement; minimum daily, 310 ft<sup>3</sup>/s (8.78 m<sup>3</sup>/s) Aug. 9, 10, 1941.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 1,950 ft<sup>3</sup>/s (55.2 m<sup>3</sup>/s) Apr. 9, gage height, 4.78 ft (1.457 m); maximum gage height, 5.19 ft (1.582 m) Dec. 30, backwater from ice; minimum daily discharge, 374 ft<sup>3</sup>/s (10.6 m<sup>3</sup>/s) Aug. 15.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	623	576	753	810	700	680	1360	679	588	531	433	646
2	639	607	842	770	700	680	1530	672	577	563	427	575
3	667	651	949	760	690	670	1640	665	564	589	441	536
4	650	702	1020	750	690	660	1810	660	556	570	434	504
5	610	696	973	730	690	660	1760	652	554	536	425	483
6	583	670	894	710	690	660	1710	647	544	514	414	467
7	563	642	876	700	690	660	1810	639	535	499	406	450
8	596	622	820	690	690	660	1880	651	542	490	402	438
9	630	614	810	680	690	660	1920	657	545	484	399	428
10	675	635	790	680	690	660	1870	667	537	479	393	421
11	741	705	770	680	700	660	1720	664	519	473	388	418
12	759	794	810	680	700	670	1550	679	517	465	386	469
13	764	835	840	680	690	680	1460	754	505	464	381	514
14	781	819	880	680	690	690	1390	885	503	462	379	744
15	760	788	910	680	690	719	1280	1080	501	457	374	837
16	711	769	930	680	690	725	1170	1210	505	445	408	945
17	663	778	933	680	690	718	1080	1220	528	436	433	1120
18	639	794	983	680	690	705	1010	1170	608	433	447	1260
19	624	769	1090	680	690	693	970	1040	712	434	498	1160
20	604	766	1250	690	690	702	915	949	854	435	556	1060
21	596	770	1400	690	690	725	885	874	871	442	583	1010
22	587	808	1480	700	690	752	865	821	723	457	529	938
23	577	844	1430	700	690	787	835	775	628	462	484	859
24	574	809	1290	700	690	826	800	723	581	451	470	783
25	571	763	1180	700	690	852	776	687	557	433	459	718
26	572	748	1120	700	690	854	760	660	569	433	452	670
27	569	708	1060	700	680	853	742	638	547	475	523	643
28	567	680	1000	700	680	903	725	618	533	493	617	623
29	564	660	960	700	---	985	708	600	517	482	668	617
30	561	680	920	700	---	1070	694	591	498	459	769	618
31	563	---	860	700	---	1160	---	586	---	445	762	---
TOTAL	19583	21702	30823	21780	19340	23379	37625	23813	17318	14791	14740	20954
MEAN	632	723	994	703	691	754	1254	768	577	477	475	698
MAX	781	844	1480	810	700	1160	1920	1220	871	589	769	1260
MIN	561	576	753	680	680	660	694	586	498	433	374	418
CFSM	.89	1.02	1.40	.99	.98	1.06	1.77	1.08	.81	.67	.67	.98
IN.	1.03	1.14	1.62	1.14	1.01	1.23	1.97	1.25	.91	.78	.77	1.10

CAL YR 1977 TOTAL 259195 MEAN 710 MAX 2720 MIN 381 CFSM 1.00 IN 13.60  
WTR YR 1978 TOTAL 265848 MEAN 728 MAX 1920 MIN 374 CFSM 1.03 IN 13.95

## STREAMS TRIBUTARY TO LAKE MICHIGAN

223

04122500 PERE MARQUETTE RIVER AT SCOTTVILLE, MI--CONTINUED

## WATER-QUALITY RECORDS

PERIOD OF DAILY RECORD.--

WATER TEMPERATURES: May 1968 to current year.

INSTRUMENTATION.--Temperature recorder since May 1968.

EXTREMES FOR PERIOD OF DAILY RECORD.--

WATER TEMPERATURES: Maximum, 25.0°C July 20, 21, 1977; minimum, 0.0°C on many days during winter periods.

EXTREMES FOR CURRENT YEAR.--

WATER TEMPERATURES: Maximum, 22.5°C June 27-30, Aug. 15, 16; minimum, 0.0°C on many days during winter period.

## TEMPERATURE (DEG. C) OF WATER, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DAY	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN
	OCTOBER		NOVEMBER		DECEMBER		JANUARY		FEBRUARY		MARCH	
1	14.5	13.5	10.5	9.5	1.0	1.0	.0	.0	.0	.0	.0	.0
2	13.5	12.5	12.0	10.5	1.5	1.0	.0	.0	.0	.0	.0	.0
3	12.0	11.0	12.0	12.0	1.0	1.0	.0	.0	.0	.0	.0	.0
4	11.0	10.5	12.0	11.5	1.0	1.0	.0	.0	.0	.0	.0	.0
5	11.5	11.5	11.5	9.5	1.0	1.0	.0	.0	.0	.0	.0	.0
6	11.5	11.0	10.5	10.0	1.0	1.0	.0	.0	.0	.0	.0	.0
7	11.0	9.5	11.5	10.5	1.0	1.0	.0	.0	.0	.0	.0	.0
8	9.5	9.5	11.5	11.5	1.0	.5	.0	.0	.0	.0	.0	.0
9	9.5	9.5	12.0	11.5	.5	.0	.0	.0	.0	.0	.0	.0
10	9.5	9.0	12.0	9.5	.0	.0	.0	.0	.0	.0	.0	.0
11	9.5	9.5	9.5	7.5	.0	.0	.0	.0	.0	.0	.5	.0
12	9.5	9.0	7.5	6.0	.5	.0	.0	.0	.0	.0	.5	.5
13	8.5	7.5	6.0	5.0	.0	.0	.0	.0	.0	.0	1.5	.5
14	8.5	7.5	5.0	5.0	.0	.0	.0	.0	.0	.0	1.5	1.5
15	8.5	8.5	5.0	4.5	.0	.0	.0	.0	.0	.0	1.5	1.5
16	8.5	8.0	5.5	5.0	1.0	.0	.0	.0	.0	.0	2.0	1.5
17	8.0	7.0	5.5	5.0	1.5	1.0	.0	.0	.0	.0	2.0	1.5
18	7.5	7.5	5.0	5.0	1.5	1.0	.0	.0	.0	.0	2.0	1.0
19	8.5	8.0	5.0	4.5	1.5	1.0	.0	.0	.0	.0	2.0	1.0
20	8.5	8.0	5.5	4.5	1.0	1.0	.0	.0	.0	.0	2.5	1.5
21	9.5	8.5	5.5	4.5	1.0	1.0	.0	.0	.0	.0	2.5	2.5
22	9.5	9.0	4.0	3.5	1.0	.5	.0	.0	.0	.0	2.5	2.0
23	9.5	8.5	3.5	2.5	.5	.5	.0	.0	.0	.0	2.5	1.5
24	10.0	8.5	2.5	2.5	.5	.5	.0	.0	.0	.0	2.5	1.5
25	11.0	10.0	2.5	1.5	.5	.0	.0	.0	.0	.0	2.0	1.0
26	11.0	11.0	1.5	1.0	.0	.0	.0	.0	.0	.0	2.0	1.5
27	11.0	11.0	1.0	1.0	.0	.0	.0	.0	.0	.0	3.5	2.0
28	11.0	10.5	1.0	1.0	.0	.0	.0	.0	.0	.0	4.0	3.0
29	10.5	9.5	1.0	1.0	.0	.0	.0	.0	---	---	4.0	2.5
30	9.5	9.0	1.0	1.0	.0	.0	.0	.0	---	---	2.5	1.5
31	9.5	9.0	---	---	.0	.0	.0	.0	---	---	3.0	1.5
MONTH	14.5	7.0	12.0	1.0	1.5	.0	.0	.0	.0	.0	4.0	.0

STREAMS TRIBUTARY TO LAKE MICHIGAN  
04122500 PERE MARQUETTE RIVER AT SCOTTVILLE, MI--CONTINUED

TEMPERATURE (DEG. C) OF WATER, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DAY	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN
	APRIL		MAY		JUNE		JULY		AUGUST		SEPTEMBER	
1	3.0	2.5	12.0	8.5	20.5	18.5	20.5	17.5	18.5	17.0	17.5	15.5
2	2.5	2.0	11.5	8.5	19.5	17.5	18.5	16.5	18.5	18.0	17.5	17.0
3	2.0	1.5	12.0	9.5	18.0	15.5	18.5	16.0	18.5	17.5	17.0	17.0
4	1.5	1.5	12.0	10.0	16.0	15.0	20.0	17.0	18.5	16.5	17.0	16.0
5	3.5	1.5	11.0	9.5	16.5	15.0	20.0	18.5	18.0	17.0	17.0	16.5
6	4.0	3.5	12.0	9.0	18.5	16.0	21.0	18.5	19.0	17.0	17.0	17.0
7	5.5	4.0	12.5	10.0	18.5	17.5	21.0	20.5	19.0	18.0	18.5	17.0
8	6.0	5.5	12.5	11.0	18.5	16.5	20.5	19.5	19.5	18.0	18.5	18.0
9	6.0	5.5	11.0	10.5	17.5	16.0	20.5	19.0	19.5	19.0	18.5	18.5
10	5.5	5.5	13.5	10.5	18.5	16.0	20.0	18.0	20.5	18.0	18.5	18.0
11	5.5	5.5	13.5	12.0	21.0	18.0	19.0	17.0	19.5	18.0	18.5	18.0
12	6.5	4.5	14.0	14.0	21.0	19.0	19.0	16.5	20.0	18.5	18.5	17.0
13	6.5	6.0	14.0	12.5	19.0	16.5	19.5	18.5	21.0	19.0	17.0	14.5
14	7.0	5.5	12.5	12.0	17.0	15.0	21.0	18.5	21.5	20.0	14.5	14.0
15	7.5	6.0	13.0	11.5	16.5	14.5	21.5	19.5	22.5	21.0	14.5	14.0
16	8.0	5.5	15.0	14.0	16.5	16.0	21.5	19.0	22.5	20.0	14.5	14.5
17	8.5	6.0	17.0	14.0	16.5	16.5	20.5	18.5	20.0	18.5	14.5	14.5
18	8.5	7.0	18.5	16.0	18.5	16.5	19.0	19.0	20.0	19.0	14.5	14.5
19	8.0	6.5	19.5	17.0	19.0	17.5	20.0	19.0	19.5	19.0	15.5	14.5
20	8.0	7.5	19.5	18.5	19.5	18.0	21.0	19.5	19.5	17.5	16.0	15.5
21	8.5	6.0	19.5	15.5	19.5	18.5	21.0	20.0	18.5	16.5	16.5	16.0
22	9.5	6.5	18.0	16.0	19.5	17.5	21.0	20.0	18.5	17.0	16.0	15.0
23	9.5	7.5	18.0	16.0	19.5	17.5	21.0	20.0	19.0	18.0	15.0	13.5
24	10.5	7.0	20.0	17.0	19.0	17.0	21.0	19.0	19.5	19.0	14.0	13.0
25	11.5	8.5	20.5	17.5	19.5	18.5	21.0	19.0	19.5	19.0	14.0	13.0
26	12.0	9.0	21.0	19.0	19.5	21.5	20.5	19.5	19.0	18.0	13.0	12.5
27	12.5	9.5	21.5	19.5	22.5	20.5	20.5	18.5	18.5	18.0	13.0	13.0
28	13.0	10.0	21.5	19.5	22.5	20.5	20.0	17.5	18.0	18.0	13.0	12.0
29	13.5	11.0	21.5	19.5	22.5	20.5	18.5	18.0	18.0	17.5	12.0	11.5
30	13.5	10.0	21.0	19.0	22.5	20.5	18.0	16.5	18.0	17.5	12.5	12.0
31	---	---	20.0	18.0	---	---	17.5	16.5	18.0	17.0	---	---
MONTH	13.5	1.5	21.5	8.5	22.5	14.5	21.5	16.0	22.5	16.5	18.5	11.5

## STREAMS TRIBUTARY TO LAKE MICHIGAN

225

04124000 MANISTEE RIVER NEAR SHERMAN, MI

LOCATION.--Lat 44°26'11", long 85°41'55", in NE¼ NE¼ sec.36, T.24 N., R.12 W., Wexford County, Hydrologic Unit 04060103, on downstream side of bridge near right pier on State Highway 37, 250 ft (76 m) upstream from Wheeler Creek, 0.9 mi (1.4 km) north of Sherman, and at mile 60.8 (97.8 km).

DRAINAGE AREA.--900 mi<sup>2</sup> (2,331 km<sup>2</sup>), approximately.

PERIOD OF RECORD.--July 1903 to May 1916, October 1930 to September 1931, October 1933 to current year. Monthly discharge only for some periods, published in WSP 1307.

REVISED RECORDS.--WSP 1004: 1936(m). WSP 1307: 1911, 1913-14(M), 1934(M), 1936(M), 1937, 1939-40(M). WSP 1437: 1911, 1913(M), 1937.

GAGE.--Nonrecording gage. Altitude of gage is 804 ft (245 m), from river-profile map. Prior to Apr. 13, 1934, at various datums.

REMARKS.--Records poor. Several observations of water temperature were made during the year.

AVERAGE DISCHARGE.--58 years (water years 1904-15, 1931, 1934-78), 1,056 ft<sup>3</sup>/s (29.91 m<sup>3</sup>/s), 15.93 in/yr (405 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 3,570 ft<sup>3</sup>/s (101 m<sup>3</sup>/s) Mar. 25, 1913, gage height, 7.1 ft (2.16 m), from graph based on gage readings, datum then in use; minimum daily, 540 ft<sup>3</sup>/s (15.3 m<sup>3</sup>/s) Feb. 21-23, 1936.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 2,520 ft<sup>3</sup>/s (71.4 m<sup>3</sup>/s) May 15, gage height, 14.57 ft (4.441 m); minimum daily, 780 ft<sup>3</sup>/s (22.1 m<sup>3</sup>/s) Aug. 13, 14.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1000	840	980	900	900	900	1350	1130	973	883	805	840
2	1020	860	1150	900	900	900	1500	1100	970	880	810	820
3	1020	920	1400	900	900	900	1600	1060	970	877	820	820
4	970	1000	1300	900	900	900	1700	1050	952	874	820	820
5	940	940	1120	900	900	900	1800	1050	940	850	830	820
6	900	900	1000	900	900	900	1900	1050	928	823	820	820
7	860	880	980	900	900	900	2000	1050	928	820	810	820
8	940	870	960	900	900	900	2100	1050	918	820	800	810
9	1050	850	950	900	900	900	2200	1050	916	820	800	820
10	1080	900	950	900	900	900	2200	1050	916	805	800	810
11	1080	980	950	900	900	910	2200	1050	916	805	790	800
12	1200	1000	940	900	900	920	2180	1060	961	802	790	810
13	1250	980	940	900	900	930	2100	1660	954	796	780	800
14	1120	920	940	900	900	940	2000	2220	964	796	780	1050
15	1000	920	940	900	900	970	1950	2400	970	790	790	1250
16	960	950	940	900	900	970	1900	1920	1020	790	820	1320
17	940	1000	955	900	900	964	1820	1360	1100	790	860	1360
18	920	1020	1150	900	900	964	1780	1170	1200	790	860	1400
19	900	1000	1260	900	900	964	1720	1040	1250	790	880	1300
20	890	980	1300	900	900	958	1650	1020	1250	796	880	1200
21	870	1020	1270	900	900	958	1620	1000	1220	817	840	1120
22	870	1100	1220	900	900	958	1580	1000	1150	826	820	1020
23	870	1080	1130	900	900	976	1500	1000	1050	823	820	960
24	870	1000	976	900	900	988	1450	1000	930	820	840	920
25	870	960	998	900	900	997	1400	1000	940	820	840	890
26	860	940	940	900	900	1000	1350	1000	940	820	840	850
27	860	920	900	900	900	1000	1300	1000	934	820	860	850
28	850	920	920	900	900	1000	1260	1000	925	820	860	850
29	850	920	920	900	---	1020	1220	1000	913	820	860	840
30	840	920	920	900	---	1020	1170	994	895	811	860	840
31	840	---	910	900	---	1080	---	994	---	808	860	---
TOTAL	29490	28490	32209	27900	25200	29487	51500	36528	29951	25402	25645	28710
MEAN	951	950	1039	900	900	951	1717	1178	993	819	827	907
MAX	1250	1100	1400	900	900	1080	2200	2400	1250	883	880	1400
MIN	840	840	900	900	900	900	1170	994	895	790	780	800
CFSM	1.06	1.06	1.15	1.00	1.00	1.06	1.91	1.31	1.11	.91	.92	1.06
IN.	1.22	1.18	1.33	1.15	1.04	1.22	2.13	1.51	1.24	1.05	1.06	1.19

CAL YR 1977 TOTAL 360144 MEAN 987 MAX 2230 MIN 724 CFSM 1.10 IN 14.89  
WTR YR 1978 TOTAL 370512 MEAN 1015 MAX 2400 MIN 780 CFSM 1.13 IN 15.31



## STREAMS TRIBUTARY TO LAKE MICHIGAN

04125500 PINE RIVER NEAR HOXEYVILLE, MI

LOCATION.--Lat 44°12'11", long 85°47'58", in SW¼ NW¼ sec.20, T.21 N., R.12 W., Wexford County, Hydrologic Unit 04060103, on right bank 500 ft (152 m) upstream from bridge on State Highway 37, 4.2 mi (6.8 km) northwest of Hoxeyville, 8.0 mi (12.9 km) east of Wellston, and 8.0 mi (12.9 km) upstream from mouth.

DRAINAGE AREA.--251 mi<sup>2</sup> (650 km<sup>2</sup>).

PERIOD OF RECORD.--July 1952 to current year.

GAGE.--Water-stage recorder. Altitude of gage is 775 ft (236 m), by barometer.

REMARKS.--Records good. Some regulation during low flows by dams above station. Several observations of water temperature were made during the year.

AVERAGE DISCHARGE.--26 years, 286 ft<sup>3</sup>/s (8.100 m<sup>3</sup>/s), 15.47 in/yr (393 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 2,440 ft<sup>3</sup>/s (69.1 m<sup>3</sup>/s) Aug. 6, 1956, gage height, 6.82 ft (2.079 m), from rating curve extended above 1,100 ft<sup>3</sup>/s (31.2 m<sup>3</sup>/s); minimum, 161 ft<sup>3</sup>/s (4.56 m<sup>3</sup>/s) Feb. 2, 1961.

EXTREMES FOR CURRENT YEAR.--Peak discharges above base of 650 ft<sup>3</sup>/s (18.4 m<sup>3</sup>/s) and maximum (\*):

Date	Time	Discharge (ft <sup>3</sup> /s) (m <sup>3</sup> /s)	Gage height (ft) (m)	Date	Time	Discharge (ft <sup>3</sup> /s) (m <sup>3</sup> /s)	Gage height (ft) (m)
Apr. 2	1600	710 20.1	3.15 0.960	May 13	2300	772 21.9	3.25 0.991
Apr. 7	2300	*1120 31.7	*3.70 1.128				

Minimum discharge, 180 ft<sup>3</sup>/s (5.10 m<sup>3</sup>/s) June 28, gage height, 1.59 ft (0.485 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	291	236	332	268	254	244	475	282	254	242	242	244
2	296	258	422	264	254	231	659	276	254	253	245	237
3	283	296	383	262	235	254	526	274	248	263	252	235
4	265	282	335	259	242	246	499	272	246	255	253	232
5	257	269	305	260	284	233	586	273	247	245	245	233
6	250	261	295	259	256	247	691	278	247	243	240	234
7	244	255	275	259	256	235	916	273	246	242	240	232
8	267	250	271	260	282	236	998	276	253	241	239	230
9	311	248	263	255	264	240	857	277	255	241	234	232
10	318	287	255	235	259	240	690	299	248	238	227	232
11	302	295	250	255	254	243	657	315	245	238	227	231
12	348	286	274	250	254	244	698	325	247	231	225	235
13	371	272	277	265	255	248	643	516	240	229	224	238
14	327	263	282	250	246	256	589	712	230	230	225	250
15	297	267	298	217	252	255	506	654	220	232	225	350
16	278	287	303	259	250	253	457	479	230	233	236	375
17	270	300	308	235	252	252	422	404	250	229	251	385
18	267	287	385	239	251	247	395	366	344	229	244	400
19	262	278	438	268	233	246	384	329	405	231	254	415
20	261	289	452	251	254	250	376	313	325	233	257	350
21	256	329	433	252	246	251	367	307	290	233	244	335
22	250	319	372	247	232	248	346	294	275	236	238	320
23	246	291	339	253	243	254	332	286	270	242	239	280
24	241	282	316	249	260	261	345	287	285	238	242	270
25	241	278	302	249	247	260	350	277	310	234	241	260
26	242	265	262	258	245	258	331	272	275	233	242	250
27	240	265	265	239	245	258	312	267	255	243	256	260
28	239	267	277	254	245	273	303	262	245	256	301	250
29	238	266	281	262	---	300	297	258	239	247	327	250
30	236	265	271	258	---	306	288	256	236	245	275	250
31	235	---	260	256	---	320	---	253	---	244	250	---
TOTAL	8429	8293	9781	7847	7050	7889	15295	10212	7914	7429	7640	8295
MEAN	272	276	316	253	252	254	510	329	264	240	246	277
MAX	371	329	452	268	284	320	998	712	405	263	327	415
MIN	235	236	250	217	232	231	288	253	220	229	224	230
CFSM	1.08	1.10	1.26	1.01	1.00	1.01	2.03	1.31	1.05	.96	.98	1.10
IN.	1.25	1.23	1.45	1.16	1.04	1.17	2.27	1.51	1.17	1.10	1.13	1.23

CAL YR 1977	TOTAL	103391	MEAN 283	MAX 1180	MIN 214	CFSM 1.13	IN 15.32
WTR YR 1978	TOTAL	106074	MEAN 291	MAX 998	MIN 217	CFSM 1.16	IN 15.72

## STREAMS TRIBUTARY TO LAKE MICHIGAN

227

04126000 MANISTEE RIVER NEAR MANISTEE, MI

LOCATION.--Lat 44°16'14", long 86°11'56", in NW¼ NW¼ sec.36, T.22 N., R.16 W., Manistee County, Hydrologic Unit 04060103, on right bank 6.4 mi (10.3 km) northeast of Manistee, 7.8 mi (12.6 km) upstream from Manistee Lake, and at mile 10.8 (17.4 km).

DRAINAGE AREA.--1,780 mi<sup>2</sup> (4,610 km<sup>2</sup>), approximately.

PERIOD OF RECORD.--October 1951 to current year. Monthly discharge only for October, November, 1951, published in WSP 1727.

GAGE.--Water-stage recorder. Altitude of gage is 585 ft (178 m), from river-profile map.

REMARKS.--Records good except those for the winter period, which are fair. Flow regulated at all stages by Tippy hydroelectric power-plant 21 mi (34 km) above station. Several observations of water temperature were made during the year.

AVERAGE DISCHARGE.--27 years, 1,993 ft<sup>3</sup>/s (56.44 m<sup>3</sup>/s), 15.21 in/yr (386 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 7,120 ft<sup>3</sup>/s (202 m<sup>3</sup>/s) Mar. 30, 1976, gage height, 8.37 ft (2.551 m); maximum gage height, 9.15 ft (2.789 m) Feb. 12, 1955, backwater from ice; minimum daily discharge, 910 ft<sup>3</sup>/s (25.8 m<sup>3</sup>/s) Sept. 10, 1978.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 4,980 ft<sup>3</sup>/s (141 m<sup>3</sup>/s) Apr. 9, gage height, 7.77 ft (2.368 m); maximum gage height, 8.74 ft (2.664 m) Feb. 2, backwater from ice; minimum discharge, 890 ft<sup>3</sup>/s (25.2 m<sup>3</sup>/s) Sept. 10, gage height, 4.32 ft (1.317 m); minimum gage height, 4.03 ft (1.228 m) June 10, 11.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1930	1750	2000	1550	2000	2000	2830	1540	1810	1630	1640	1630
2	1970	2160	2300	1800	1850	1500	2430	2180	1980	1450	1430	1540
3	1710	1780	2400	2100	1650	1050	3370	2130	1840	1810	1390	1020
4	1810	2050	2420	2000	1800	1550	3550	2000	1480	1810	1890	1100
5	1910	1990	2100	1800	1450	1300	3550	1910	1470	1580	1700	1380
6	1980	1880	2100	1800	1550	1800	3490	1790	1780	1790	1400	1490
7	1840	1660	2000	1900	1450	1700	3790	1640	1850	1660	1350	1420
8	1810	1790	2180	1700	1750	1800	4120	1540	1920	2110	1570	1250
9	1440	1840	1870	1700	1700	1950	4620	2100	1850	1840	1470	1280
10	1680	1850	1670	2000	1850	2050	4700	2110	1710	1690	1410	910
11	2180	2120	1600	1600	1650	2200	4580	2330	1520	1520	1430	1310
12	2810	2380	1400	1450	1400	2200	4460	2210	1510	1570	1330	1300
13	2720	1870	1800	1600	1600	2200	4180	2310	1920	1550	1450	1750
14	2460	1570	2000	1500	2100	2270	4090	2990	1810	1530	1300	1960
15	2150	2100	2430	1350	1800	2180	4090	3490	1940	1530	1500	2360
16	1940	1820	2710	1550	1800	1950	4060	3580	1590	1460	1590	2490
17	1780	2090	2000	1700	1800	1780	3730	3280	1670	1380	1480	2080
18	2040	2110	1700	1650	1700	1680	3300	3020	1890	1440	1160	2490
19	1970	1990	1850	1600	1500	1650	3140	2700	2170	1410	1580	2860
20	1950	1730	2850	1550	1350	1690	2970	2150	2510	1390	1610	2940
21	1850	1980	2700	1650	1750	1930	2730	2060	1780	1420	1160	2910
22	1820	2210	2800	1600	1750	1690	2820	1960	2230	1400	1920	2650
23	1420	2350	2950	1900	1800	1760	2490	2190	2200	1200	1510	2320
24	1660	2460	2600	1800	1700	1840	2330	2150	1490	1410	1090	1890
25	1760	2180	2000	1800	2050	1780	2630	1900	1450	1700	1120	1270
26	1700	1750	1800	1800	1200	1630	2310	1850	1350	1650	1380	1790
27	1710	1450	1500	1750	2000	2050	2370	1840	1600	1500	1280	1670
28	1820	1700	1700	1300	2200	1880	2260	1640	1900	1630	1590	1710
29	1890	1720	1800	1400	---	2130	1780	1450	1730	1600	1740	1980
30	1410	2100	1650	1750	---	2140	1690	1940	1710	1470	1710	1990
31	1460	---	1550	1800	---	2280	---	1960	---	1300	1740	---
TOTAL	58580	58430	64430	52450	48200	57610	98460	67940	53660	48430	45920	54740
MEAN	1890	1948	2078	1692	1721	1858	3282	2192	1789	1562	1481	1825
MAX	2810	2460	2950	2100	2200	2280	4700	3580	2510	2110	1920	2940
MIN	1410	1450	1400	1300	1200	1050	1690	1450	1350	1200	1090	910
CFSM	1.06	1.09	1.17	.95	.97	1.04	1.84	1.23	1.01	.88	.83	1.03
IN.	1.22	1.22	1.35	1.10	1.01	1.20	2.06	1.42	1.12	1.01	.96	1.14

CAL YR 1977 TOTAL 706010 MEAN 1934 MAX 6230 MIN 1020 CFSM 1.09 IN 14.75  
WTR YR 1978 TOTAL 708850 MEAN 1942 MAX 4700 MIN 910 CFSM 1.09 IN 14.81

## STREAMS TRIBUTARY TO LAKE MICHIGAN

04126520 MANISTEE RIVER AT MANISTEE, MI  
(National stream-quality accounting network and pesticide station)

LOCATION (corrected).--Lat 44°15'02", long 86°19'09", in SW¼ SW¼ sec.1, T.21 N., R.17 W., Manistee County, Hydrologic Unit 04060103, at upstream side of bridge on U.S. Highway 31, in Manistee, and 1.5 mi (2.1 km) upstream from mouth.

DRAINAGE AREA.--2,000 mi<sup>2</sup> (5,180 km<sup>2</sup>), approximately.

PERIOD OF RECORD.--Water years 1975 to current year.

PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE: November 1974 to current year.

WATER TEMPERATURES: November 1974 to current year.

INSTRUMENTATION.--Water-quality monitor since March 1977.

REMARKS.--In addition to water-quality monitor, samples were collected by a local observer on an approximate twice-weekly basis. Water-discharge measurements are made at times of monthly sampling. Interruptions in the record were due to malfunctions of the instrument.

COOPERATION.--Pesticide samples were collected by the U.S. Geological Survey and analyzed by the U.S. Environmental Protection Agency.

EXTREMES FOR PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE: Maximum daily, 1,680 micromhos Nov. 18, 1974; minimum daily, 236 micromhos, Apr. 6, 1976.

WATER TEMPERATURES: Maximum daily, 25.0°C July 20, 21, 1977; minimum daily, 0.0°C on many days during winter periods.

EXTREMES FOR CURRENT YEAR.--

SPECIFIC CONDUCTANCE: Maximum recorded, 781 micromhos May 27; minimum, 269 micromhos Jan. 18.

WATER TEMPERATURES: Maximum, 23.5°C June 30, July 8, 20, Aug. 15, 16; minimum, 0.0°C on many days during winter period.

## WATER QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DATE	TIME	STREAM- FLOW, INSTAN- TANEOUS (CFS)	SPE- CIFIC CON- DUCT- ANCE (MICRO- MHOS)	PH (UNITS)	TEMPER- ATURE (DEG C)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED (MG/L)	COLI- FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML)	STREP- TOCOCCI FECAL, KF AGAR (COLS. 100 ML)	HARD- NESS (MG/L AS CAC03)	HARD- NESS, NONCAR- BONATE (MG/L CAC03)
OCT											
05...	1500	2100	439	8.2	15.0	8.8	88	510	76	190	40
NOV											
09...	1340	2370	406	8.2	12.0	--	--	93	76	180	32
DEC											
07...	1315	2460	431	8.1	1.0	12.0	85	240	69	180	47
JAN											
12...	1345	1000	395	7.9	.0	--	--	260	73	200	48
FEB											
07...	1100	1300	410	7.9	.0	9.3	63	200	86	190	34
MAR											
15...	1000	3890	458	7.7	.0	11.6	80	K260	96	180	24
APR											
13...	0930	4350	380	7.6	4.5	10.8	84	52	K23	150	28
MAY											
10...	1015	2840	381	8.0	11.0	10.0	91	260	K26	170	34
JUN											
14...	0930	1840	470	8.0	16.5	8.0	81	293	47	200	58
JUL											
13...	0930	2210	400	8.2	21.0	--	--	153	78	180	31
AUG											
10...	1030	1530	455	8.3	21.0	8.6	99	250	95	200	44
SEP											
13...	0945	1790	440	8.2	18.0	9.0	95	K1200	260	190	38

K - Results based on colony count outside the acceptable range (non-ideal colony count).

DATE	CALCIUM DIS- SOLVED (MG/L AS CA)	MAGNE- SIUM, DIS- SOLVED (MG/L AS MG)	SODIUM, DIS- SOLVED (MG/L AS NA)	SODIUM AD- SORP- TION RATIO	SODIUM PERCENT	POTAS- SIUM, DIS- SOLVED (MG/L AS K)	BICAR- BONATE (MG/L AS HC03)	CAR- BONATE (MG/L AS C03)	ALKA- LINITY (MG/L AS CAC03)	CARBON DIOXIDE DIS- SOLVED (MG/L AS C02)	SULFATE DIS- SOLVED (MG/L AS S04)
OCT											
05...	52	14	20	.6	19	1.5	180	0	150	1.8	15
NOV											
09...	54	12	9.0	.3	10	1.4	180	0	150	1.8	14
DEC											
07...	50	13	21	.7	20	1.3	160	0	130	2.0	17
JAN											
12...	57	13	17	.5	16	3.3	180	0	150	3.6	16
FEB											
07...	52	14	15	.5	15	1.1	190	0	160	3.8	18
MAR											
15...	51	13	20	.6	19	1.2	190	0	160	6.1	14
APR											
13...	44	10	14	.5	17	1.2	150	0	120	6.0	15
MAY											
10...	48	11	11	.4	13	1.4	160	0	130	2.6	15
JUN											
14...	58	13	14	.4	13	1.5	170	0	140	2.7	10
JUL											
13...	50	13	13	.4	14	1.1	180	0	150	1.8	12
AUG											
10...	56	14	14	.4	13	1.4	190	0	160	1.5	13
SEP											
13...	53	13	14	.4	14	1.5	180	0	150	1.8	16

## STREAMS TRIBUTARY TO LAKE MICHIGAN

229

04126520 MANISTEE RIVER AT MANISTEE, MI--CONTINUED

WATER-QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978--CONTINUED

DATE	CHLORIDE, DIS-SOLVED (MG/L AS CL)	FLUORIDE, DIS-SOLVED (MG/L AS F)	SILICA, DIS-SOLVED (MG/L AS SiO2)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L)	SOLIDS, SUM OF CONSTITUENTS, DIS-SOLVED (MG/L)	SOLIDS, DIS-SOLVED (TONS PER DAY)	NITRO- GEN, NO2+NO3 TOTAL (MG/L AS N)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N)	NITRO- GEN, ORGANIC TOTAL (MG/L AS N)	NITRO- GEN,AM- MONIA + ORGANIC TOTAL (MG/L AS N)
OCT 05...	44	.1	7.8	257	243	1460	.17	.08	--	--
NOV 09...	28	.1	8.1	241	215	1540	.22	.05	--	--
DEC 07...	43	.1	8.3	253	233	1680	.27	.05	--	--
JAN 12...	51	.1	9.1	233	255	629	.31	.06	--	--
FEB 07...	29	.1	9.3	235	232	825	.30	.04	.19	.23
MAR 15...	41	.1	8.5	233	242	2450	.33	.06	.26	.32
APR 13...	33	.1	6.9	215	198	2530	.26	.03	.49	.52
MAY 10...	32	.1	6.4	226	204	1730	.17	.07	.20	.27
JUN 14...	49	.1	7.1	--	236	1170	.15	.06	.29	.35
JUL 13...	33	.1	5.7	246	217	1470	.08	.00	.36	.36
AUG 10...	42	.1	6.9	281	239	1160	.09	.04	.48	.52
SEP 13...	38	.1	7.0	242	231	1170	.09	.05	.24	.29

DATE	NITRO- GEN, NH4 + ORG. SUSP. TOTAL (MG/L AS N)	NITRO- GEN, AM- MONIA + ORGANIC DIS- (MG/L AS N)	NITRO- GEN, TOTAL (MG/L AS N)	NITRO- GEN, TOTAL (MG/L AS NO3)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, DIS-SOLVED (MG/L AS P)	CARBON, ORGANIC TOTAL (MG/L AS C)	SEDI- MENT, DIS- CHARGE, SUS- PENDED (MG/L)	SEDI- MENT, DIS- CHARGE, SUS- PENDED (T/DAY)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM
OCT 05...	--	.13	--	--	.06	.01	--	6	34	100
NOV 09...	--	.24	--	--	.03	.02	--	4	26	100
DEC 07...	--	.21	--	--	.02	.01	7.0	4	27	100
JAN 12...	--	.27	--	--	.01	.00	--	3	8.1	100
FEB 07...	.05	.18	.53	2.3	.14	.12	2.0	6	21	100
MAR 15...	.03	.29	.65	2.9	.01	.01	3.4	14	147	100
APR 13...	.25	.27	.78	3.5	.04	.02	--	9	106	100
MAY 10...	.06	.21	.44	1.9	.03	.01	12	7	54	100
JUN 14...	.00	.38	.50	2.2	.02	.00	4.8	10	50	100
JUL 13...	.05	.31	.44	1.9	.01	.01	--	9	54	100
AUG 10...	.22	.30	.61	2.7	.03	.02	7.7	3	12	100
SEP 13...	.07	.22	.38	1.7	.03	.01	7.5	10	48	100

STREAMS TRIBUTARY TO LAKE MICHIGAN  
04126520 MANISTEE RIVER AT MANISTEE, MI--CONTINUED

WATER-QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978--CONTINUED

DATE	TIME	ARSENIC TOTAL (UG/L AS AS)	ARSENIC DIS- SOLVED (UG/L AS AS)	BARIUM, TOTAL RECOV- ERABLE (UG/L AS BA)	BARIUM, DIS- SOLVED (UG/L AS BA)	CADMIUM TOTAL RECOV- ERABLE (UG/L AS CD)	CADMIUM DIS- SOLVED (UG/L AS CD)	CHRO- MIUM, TOTAL RECOV- ERABLE (UG/L AS CR)	CHRO- MIUM, DIS- SOLVED (UG/L AS CR)	COBALT, TOTAL RECOV- ERABLE (UG/L AS CO)
OCT 05...	1500	3	3	0	0	0	0	<10	3	0
JAN 12...	1345	0	0	0	0	2	1	<10	0	0
APR 13...	0930	1	1	0	0	3	2	<10	0	0
JUL 13...	0930	0	0	0	0	0	0	10	1	2

DATE	COBALT, DIS- SOLVED (UG/L AS CO)	COPPER, TOTAL RECOV- ERABLE (UG/L AS CU)	COPPER, DIS- SOLVED (UG/L AS CU)	IRON, TOTAL RECOV- ERABLE (UG/L AS FE)	IRON, DIS- SOLVED (UG/L AS FE)	LEAD, TOTAL RECOV- ERABLE (UG/L AS PB)	LEAD, DIS- SOLVED (UG/L AS PB)	MANGA- NESE, TOTAL RECOV- ERABLE (UG/L AS MN)	MANGA- NESE, DIS- SOLVED (UG/L AS MN)	MERCURY TOTAL RECOV- ERABLE (UG/L AS HG)
OCT 05...	0	5	3	240	30	--	--	30	10	<.5
JAN 12...	0	7	6	260	100	--	20	30	30	<.5
APR 13...	0	7	4	390	70	--	3	20	20	<.5
JUL 13...	0	8	6	250	20	21	1	10	0	.5

DATE	MERCURY DIS- SOLVED (UG/L AS HG)	SELE- NIUM, TOTAL (UG/L AS SE)	SELE- NIUM, DIS- SOLVED (UG/L AS SE)	SILVER, TOTAL RECOV- ERABLE (UG/L AS AG)	SILVER, DIS- SOLVED (UG/L AS AG)	ZINC, TOTAL RECOV- ERABLE (UG/L AS ZN)	ZINC, DIS- SOLVED (UG/L AS ZN)	CARBON, ORGANIC DIS- SOLVED (MG/L AS C)	CARBON, ORGANIC SUS- PENDED TOTAL (MG/L AS C)
OCT 05...	<.5	0	0	0	0	10	0	10	--
JAN 12...	<.5	0	0	0	0	30	10	6.8	--
APR 13...	<.5	0	0	0	0	20	20	3.1	.9
JUL 13...	.5	0	0	0	0	0	0	12	.8

QUALITATIVE AND ASSOCIATED QUANTITATIVE ANALYSES OF BIOLOGICAL DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
PERIPHYTON

DATE	TIME	LENGTH OF EXPO- SURE (DAYS)	PERI- PHYTON BIOMASS ASH WEIGHT G/SQ M	PERI- PHYTON BIOMASS TOTAL DRY WEIGHT G/SQ M	CHLOR-A PERI- PHYTON CHROMO- GRAPHIC FLUOROM (MG/M2)	CHLOR-B PERI- PHYTON CHROMO- GRAPHIC FLUOROM (MG/M2)
NOV 09...	1340	35	4.88	6.61	5.42	1.86
MAR 15...	1000	36	.787	1.02	.330	.000
MAY 10...	1015	27	13.8	19.8	26.8	.000
AUG 10...	1030	28	9.69	21.0	13.7	2.83



## 04126520 MANISTEE RIVER AT MANISTEE, MI--CONTINUED

## WATER-QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978--CONTINUED

DATE	TIME	PCB, TOTAL (UG/L)	AROCLOR TOT. IN BOT MAT 1254 PCB SERIES (UG/KG)	ALDRIN, TOTAL (UG/L)	ALDRIN, TOTAL IN BOT- TOM MA- TERIAL (UG/KG)	ATRA- ZINE, TOTAL (UG/L)	ATRA- ZINE, TOTAL IN BOT- TOM MA- TERIAL (UG/KG)	CHLOR- DANE, TOTAL (UG/L)	CHLOR- DANE, TOTAL IN BOT- TOM MA- TERIAL (UG/KG)	DDD, TOTAL (UG/L)	DDD, TOTAL IN BOT- TOM MA- TERIAL (UG/KG)
NOV 09...	1340	ND	1	ND	ND	ND	ND	ND	ND	ND	ND
FEB 07...	1100	--	--	ND	--	--	--	ND	--	ND	--
MAY 10...	1015	ND	--	ND	ND	ND	--	ND	ND	ND	ND
AUG 10...	1030	ND	--	ND	--	ND	--	ND	--	ND	--

DATE	DDE, TOTAL (UG/L)	DDE, TOTAL IN BOT- TOM MA- TERIAL (UG/KG)	DDT, TOTAL (UG/L)	DDT, TOTAL IN BOT- TOM MA- TERIAL (UG/KG)	DI- AZINON, TOTAL (UG/L)	DI- AZINON, TOTAL IN BOT- TOM MA- TERIAL (UG/KG)	DI- ELDRIN TOTAL (UG/L)	DI- ELDRIN, TOTAL IN BOT- TOM MA- TERIAL (UG/KG)	ENDRIN, TOTAL (UG/L)	ENDRIN, TOTAL IN BOT- TOM MA- TERIAL (UG/KG)
NOV 09...	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
FEB 07...	ND	--	ND	--	ND	--	ND	--	ND	--
MAY 10...	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
AUG 10...	ND	--	ND	--	ND	--	ND	--	ND	--

DATE	ETHION, TOTAL (UG/L)	ETHION, TOTAL IN BOT- TOM MA- TERIAL (UG/KG)	HEPTA- CHLOR, TOTAL (UG/L)	HEPTA- CHLOR, TOTAL IN BOT- TOM MA- TERIAL (UG/KG)	HEPTA- CHLOR EPOXIDE TOTAL (UG/L)	HEPTA- CHLOR EPOXIDE TOT. IN BOTTOM MATL. (UG/KG)	LINDANE TOTAL (UG/L)	LINDANE TOTAL IN BOT- TOM MA- TERIAL (UG/KG)	MALA- THION, TOTAL (UG/L)	MALA- THION, TOTAL IN BOT- TOM MA- TERIAL (UG/KG)
NOV 09...	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
FEB 07...	ND	--	ND	--	ND	--	ND	--	ND	--
MAY 10...	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
AUG 10...	ND	--	ND	--	ND	--	ND	--	ND	--

DATE	METH- OXY- CHLOR, TOTAL (UG/L)	METH- OXY- CHLOR, TOT. IN BOTTOM MATL. (UG/KG)	METHYL PARA- THION, TOTAL (UG/L)	METHYL PARA- THION, TOT. IN BOTTOM MATL. (UG/KG)	METHYL TRI- THION, TOTAL (UG/L)	METHYL TRI- THION, TOT. IN BOTTOM MATL. (UG/KG)	PARA- THION, TOTAL (UG/L)	PARA- THION, TOTAL IN BOT- TOM MA- TERIAL (UG/KG)	SIMA- ZINE TOTAL COUL- SON (UG/L)	SIMA- ZINE IN BOTTOM MATERI- AL (UG/ KG DRY SOLIDS)
NOV 09...	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
FEB 07...	ND	--	ND	--	ND	--	ND	--	--	--
MAY 10...	ND	ND	ND	ND	ND	ND	ND	ND	ND	--
AUG 10...	ND	--	ND	--	ND	--	ND	--	ND	--

DATE	TOXA- PHENE, TOTAL (UG/L)	TOXA- PHENE, TOTAL IN BOT- TOM MA- TERIAL (UG/KG)	TOTAL TRI- THION (UG/L)	TRI- THION, TOTAL IN BOT- TOM MA- TERIAL (UG/KG)	2,4-D, TOTAL (UG/L)	2,4-D, TOTAL IN BOT- TOM MA- TERIAL (UG/KG)	2,4,5-T TOTAL (UG/L)	2,4,5-T TOTAL IN BOT- TOM MA- TERIAL (UG/KG)	SILVEX, TOTAL (UG/L)	SILVEX, TOTAL IN BOT- TOM MA- TERIAL (UG/KG)
NOV 09...	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
FEB 07...	ND	--	ND	--	--	--	--	--	--	--
MAY 10...	ND	ND	ND	ND	--	--	--	--	--	--
AUG 10...	ND	--	ND	--	--	--	--	--	--	--

ND--Not detected

STREAMS TRIBUTARY TO LAKE MICHIGAN  
04126520 MANISTEE RIVER AT MANISTEE, MI--CONTINUED

SPECIFIC CONDUCTANCE (MICROMHOS/CM AT 25 DEG. C), WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
OCTOBER			NOVEMBER			DECEMBER			JANUARY			
1	459	362	409	475	341	395	480	330	401	352	280	313
2	417	347	383	406	337	376	479	414	441	381	304	326
3	428	347	387	398	350	369	474	390	429	365	296	324
4	442	365	396	445	348	397	486	397	431	372	287	330
5	455	388	417	447	384	410	424	340	373	392	289	329
6	444	361	404	483	385	426	452	352	399	391	291	323
7	432	374	398	422	366	399	464	408	440	354	273	311
8	420	371	398	416	367	397	472	397	432	367	275	316
9	445	379	403	441	331	381	470	363	405	348	284	315
10	467	369	397	450	342	400	471	388	432	368	289	319
11	469	369	408	579	387	513	454	416	442	363	293	324
12	485	384	425	492	352	406	540	379	448	344	291	319
13	419	365	384	417	357	393	476	375	426	326	282	298
14	447	368	398	480	347	404	479	339	417	321	283	298
15	435	356	388	489	335	392	428	342	396	322	282	302
16	488	367	396	453	342	389	422	330	363	338	279	298
17	431	347	396	444	350	385	405	312	341	327	272	297
18	457	374	404	479	380	427	383	312	351	345	269	303
19	438	376	413	481	378	425	382	314	353	361	287	314
20	440	358	396	411	339	367	366	306	337	309	276	289
21	440	340	386	476	376	432	461	322	359	301	272	282
22	433	366	400	476	364	418	481	354	416	306	274	286
23	458	370	408	404	322	365	416	319	365	311	278	288
24	466	366	400	463	369	422	498	301	376	346	288	319
25	434	348	377	483	345	398	532	409	449	384	304	340
26	466	365	403	458	378	412	450	381	415	375	283	330
27	458	375	409	501	347	410	412	342	383	340	294	312
28	440	362	395	411	334	365	391	314	353	346	307	324
29	455	362	397	457	332	377	409	308	347	329	300	315
30	449	363	413	386	330	360	389	312	350	325	299	307
31	440	356	391	---	---	---	381	309	342	334	298	308
MONTH	488	340	399	579	322	400	540	301	394	392	269	312

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
FEBRUARY			MARCH			APRIL			MAY			
1	337	306	321	379	343	362	488	342	411	403	323	358
2	337	313	325	393	357	368	517	390	461	372	320	351
3	338	312	325	397	356	377	465	343	391	462	328	363
4	344	307	324	386	357	370	532	364	438	405	292	344
5	332	297	318	393	353	371	497	365	433	387	305	330
6	335	307	319	392	352	375	448	329	376	413	312	351
7	334	315	322	393	374	380	438	358	397	426	300	350
8	335	311	318	400	355	381	468	347	401	392	290	332
9	332	313	324	402	351	381	484	321	396	---	---	---
10	326	311	318	390	362	378	453	304	374	---	---	---
11	338	311	320	406	346	375	481	334	408	---	---	---
12	345	319	331	450	363	401	523	292	408	---	---	---
13	363	307	329	480	401	428	512	366	450	---	---	---
14	355	315	328	462	412	425	502	381	439	---	---	---
15	345	314	327	418	384	404	507	389	436	---	---	---
16	373	319	334	404	374	389	516	369	436	523	356	405
17	376	323	341	399	387	395	533	354	436	499	366	421
18	360	310	334	431	379	402	498	320	399	385	353	366
19	343	314	326	430	365	392	453	346	398	402	344	360
20	336	310	323	459	348	378	421	349	386	419	339	368
21	356	324	334	435	361	392	423	346	379	470	387	413
22	355	313	333	406	361	382	452	344	392	542	362	409
23	363	327	341	399	359	379	437	298	363	675	357	427
24	391	331	351	416	379	394	428	314	360	577	354	390
25	380	331	352	408	371	383	431	320	360	454	360	393
26	358	338	349	385	364	371	420	329	355	740	347	417
27	358	334	344	410	374	384	499	336	373	781	363	420
28	379	335	353	386	364	375	465	328	371	452	360	399
29	---	---	---	428	370	400	374	309	340	522	360	431
30	---	---	---	414	368	394	396	326	356	566	364	419
31	---	---	---	411	345	375	---	---	---	531	349	430
MONTH	391	297	331	480	343	386	533	292	397			

04126520 MANISTEE RIVER AT MANISTEE, MI--CONTINUED

## SPECIFIC CONDUCTANCE (MICROMHOS/CM AT 25 DEG. C), WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
	JUNE			JULY			AUGUST			SEPTEMBER		
1	476	366	405	484	376	412	492	411	441	612	381	428
2	427	367	396	479	390	427	512	392	420	578	388	422
3	444	352	382	471	361	414	505	394	431	636	389	442
4	567	370	409	479	372	423	448	381	412	678	379	478
5	634	360	428	462	375	416	506	363	399	607	410	479
6	613	361	403	450	358	412	543	379	435	475	390	425
7	663	355	412	438	358	395	578	362	456	457	386	421
8	471	364	404	491	372	430	488	296	391	612	369	423
9	538	360	404	491	352	410	590	374	440	475	380	417
10	461	366	394	456	370	412	547	387	437	526	408	450
11	426	338	389	460	364	404	598	375	422	506	396	437
12	648	356	429	469	368	403	543	377	447	485	385	429
13	426	342	388	603	379	439	559	388	471	439	382	413
14	538	347	404	528	381	447	580	410	469	458	372	403
15	542	350	405	547	387	456	565	387	464	444	373	411
16	540	334	409	586	381	452	668	409	481	449	350	403
17	545	349	442	501	369	420	571	389	456	458	366	404
18	592	350	412	515	375	406	628	411	487	459	358	414
19	590	354	403	488	377	415	622	414	494	466	378	409
20	418	335	378	493	382	424	531	398	444	510	348	405
21	481	344	389	538	390	449	537	405	456	449	345	395
22	461	341	379	513	365	410	473	395	437	444	367	393
23	415	340	371	506	390	434	485	389	423	417	361	388
24	431	335	371	486	391	423	508	405	458	440	365	395
25	507	378	429	582	378	418	545	411	456	455	364	391
26	562	376	427	472	370	408	526	400	444	450	336	360
27	555	393	450	473	376	408	573	406	457	435	349	385
28	477	351	404	496	387	428	523	392	433	393	338	371
29	437	356	400	477	385	423	511	296	431	432	352	385
30	472	373	416	513	404	433	569	364	409	431	348	376
31	---	---	---	462	370	419	535	367	406	---	---	---
MONTH	663	334	404	603	352	422	668	296	442	678	336	412

## TEMPERATURE (DEG. C) OF WATER, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
	OCTOBER			NOVEMBER			DECEMBER			JANUARY		
1	16.5	15.5	16.0	10.5	9.5	10.0	3.0	2.0	2.5	.0	.0	.0
2	15.5	15.0	15.0	11.5	11.0	11.0	2.5	1.0	1.5	.0	.0	.0
3	15.5	14.0	14.5	11.5	11.5	11.5	1.5	1.0	1.0	.0	.0	.0
4	15.0	14.0	14.5	11.5	10.5	11.0	1.5	1.0	1.0	.0	.0	.0
5	15.0	14.0	14.5	10.5	9.5	10.0	1.0	.5	1.0	.0	.0	.0
6	14.0	13.0	13.5	11.0	10.0	10.5	1.0	.5	.5	.0	.0	.0
7	13.0	12.0	12.5	11.5	10.5	11.0	.5	.5	.5	.0	.0	.0
8	12.5	11.5	12.0	11.5	11.0	11.5	.5	.0	.0	.5	.0	.0
9	12.0	11.5	11.5	11.5	11.5	11.5	.5	.0	.0	.0	.0	.0
10	11.5	11.0	11.0	11.5	10.0	11.0	.5	.0	.0	.0	.0	.0
11	11.5	11.0	11.0	10.0	7.5	9.5	.5	.0	.0	.5	.0	.0
12	11.0	10.0	10.5	7.5	6.0	6.5	1.0	.0	.5	.5	.0	.0
13	10.0	9.5	9.5	6.5	5.5	6.0	1.0	.5	1.0	.5	.0	.0
14	10.5	9.5	9.5	6.5	5.5	6.0	1.0	.5	1.0	.0	.0	.0
15	11.0	10.0	10.5	7.0	5.5	6.5	1.5	1.0	1.5	.0	.0	.0
16	10.0	9.5	9.5	7.0	6.5	7.0	2.0	1.5	1.5	.5	.0	.0
17	9.5	9.0	9.0	7.0	6.5	7.0	2.0	1.5	1.5	.0	.0	.0
18	10.0	9.0	9.5	6.5	5.5	6.0	2.0	2.0	2.0	.5	.0	.0
19	10.0	9.5	9.5	5.5	5.0	5.5	2.0	1.5	2.0	.5	.0	.0
20	10.0	9.5	9.5	6.0	5.0	5.5	2.0	1.5	2.0	.5	.0	.0
21	10.0	9.5	10.0	6.0	4.5	5.0	1.5	1.0	1.5	.5	.0	.0
22	10.0	9.5	10.0	4.5	3.5	4.5	1.5	1.0	1.0	.5	.0	.5
23	9.5	9.0	9.5	4.0	3.5	4.0	1.5	1.0	1.0	.5	.0	.5
24	10.0	9.0	9.5	4.0	4.0	4.0	1.5	1.0	1.0	1.0	.5	1.0
25	11.0	10.0	10.5	4.0	2.5	3.5	1.0	.0	.0	1.0	.5	1.0
26	11.0	11.0	11.0	2.5	2.0	2.0	.0	.0	.0	1.0	.5	1.0
27	11.0	10.5	10.5	3.0	1.0	1.5	.0	.0	.0	1.0	.5	1.0
28	11.0	10.0	10.5	1.5	1.0	1.5	.0	.0	.0	1.0	1.0	1.0
29	10.5	9.5	10.0	2.0	1.5	2.0	.0	.0	.0	1.0	1.0	1.0
30	10.0	9.5	9.5	2.5	1.5	2.0	.0	.0	.0	1.5	1.0	1.0
31	10.0	9.5	9.5	---	---	---	.0	.0	.0	1.5	.5	1.0
MONTH	16.5	9.0	11.0	11.5	1.0	7.0	3.0	.0	1.0	1.5	.0	.5

STREAMS TRIBUTARY TO LAKE MICHIGAN  
04126520 MANISTEE RIVER AT MANISTEE, MI--CONTINUED

TEMPERATURE (DEG. C) OF WATER, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
FEBRUARY			MARCH			APRIL			MAY			
1	1.5	1.0	1.0	1.0	.0	.5	4.0	2.5	3.5	10.0	9.0	9.5
2	1.0	1.0	1.0	.0	.0	.0	2.5	2.0	2.5	10.0	9.0	9.5
3	1.5	1.0	1.0	.5	.0	.0	2.5	2.0	2.0	11.0	9.5	10.0
4	1.0	.5	1.0	.0	.0	.0	2.5	2.0	2.0	11.0	10.0	10.5
5	1.0	1.0	1.0	.0	.0	.0	4.0	2.0	3.0	11.0	9.5	10.5
6	1.0	1.0	1.0	.0	.0	.0	3.5	2.5	3.0	11.5	10.5	11.0
7	1.0	1.0	1.0	.0	.0	.0	4.0	3.0	3.5	12.5	11.0	11.5
8	1.0	1.0	1.0	.0	.0	.0	4.5	2.5	3.5	12.0	11.5	12.0
9	1.0	1.0	1.0	.5	.0	.0	3.5	2.5	3.0	---	---	---
10	1.0	1.0	1.0	.5	.0	.0	3.5	2.5	3.0	---	---	---
11	1.5	1.0	1.0	.5	.0	.0	4.5	3.0	4.0	---	---	---
12	1.5	1.0	1.0	.5	.0	.0	5.5	3.5	4.5	---	---	---
13	1.5	1.0	1.5	1.0	.0	.5	5.5	5.0	5.0	---	---	---
14	1.5	.5	1.0	1.0	.0	.5	6.5	5.0	5.5	---	---	---
15	1.5	1.0	1.0	1.0	.5	.5	7.5	5.5	6.5	---	---	---
16	1.5	1.0	1.0	1.5	1.0	1.5	7.5	6.0	7.0	14.0	13.0	13.0
17	1.5	.5	1.0	2.0	1.5	2.0	7.5	6.0	7.0	16.0	13.5	14.5
18	1.0	.5	1.0	2.0	1.5	2.0	7.5	6.0	7.0	17.0	15.0	16.0
19	1.0	.5	.5	2.5	1.0	1.5	7.5	6.0	6.5	17.5	16.0	17.0
20	1.0	.5	1.0	2.5	2.0	2.0	7.0	6.5	7.0	18.0	17.0	17.5
21	.5	.5	.5	2.5	2.0	2.5	7.5	5.5	6.5	16.5	15.5	16.0
22	.5	.0	.5	2.5	2.0	2.5	8.0	7.0	7.5	17.0	15.5	16.0
23	.5	.0	.5	4.0	2.5	3.0	8.0	7.0	7.5	17.0	16.0	16.5
24	1.0	.5	.5	2.5	2.0	2.5	8.0	7.0	7.5	18.0	16.0	17.0
25	.5	.0	.5	2.5	2.0	2.0	9.0	8.0	8.5	18.5	17.0	17.5
26	.5	.0	.5	3.0	2.0	2.5	10.0	8.5	9.5	20.0	17.5	19.0
27	.5	.0	.0	4.0	2.5	3.0	10.0	9.5	9.5	21.0	19.5	20.0
28	1.0	.0	.5	4.5	3.5	4.0	10.5	9.5	10.0	22.0	20.0	21.0
29	---	---	---	4.0	3.5	3.5	11.0	10.5	11.0	22.0	20.5	21.5
30	---	---	---	3.5	2.5	3.0	10.5	9.5	10.0	22.0	21.0	21.5
31	---	---	---	4.5	3.0	3.5	---	---	---	22.0	20.5	21.0
MONTH	1.5	.0	1.0	4.5	.0	1.5	11.0	2.0	6.0			

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
JUNE			JULY			AUGUST			SEPTEMBER			
1	21.0	20.0	21.0	23.0	21.5	22.0	21.0	20.0	20.5	21.0	20.0	20.5
2	21.0	19.5	20.5	21.5	21.0	21.0	21.0	20.5	20.5	20.5	20.5	20.5
3	20.0	19.0	19.5	21.5	20.5	21.0	20.5	20.0	20.5	20.5	20.5	20.5
4	19.5	18.0	19.0	22.0	21.0	21.0	20.0	20.0	20.0	20.5	20.0	20.0
5	19.5	18.0	18.5	22.0	21.0	21.5	20.0	19.5	20.0	20.5	20.0	20.0
6	19.5	18.5	19.0	22.5	21.5	22.0	20.0	20.0	20.0	20.5	20.5	20.5
7	20.0	19.5	19.5	23.0	22.5	23.0	21.0	20.0	20.5	21.0	20.5	20.5
8	19.5	18.0	18.5	23.5	22.0	22.5	21.0	20.5	20.5	21.5	21.0	21.0
9	18.5	18.0	18.5	22.5	21.5	22.0	21.5	21.0	21.0	21.0	20.5	20.5
10	19.0	17.5	18.0	22.0	21.5	21.5	21.5	20.5	21.0	21.5	20.5	21.0
11	20.0	18.5	19.0	21.5	21.0	21.5	21.0	20.5	20.5	21.5	21.5	21.5
12	20.0	18.5	19.5	21.5	21.0	21.5	22.0	20.5	21.5	22.0	20.5	21.0
13	18.5	17.5	18.0	23.0	21.5	22.0	22.5	21.5	22.0	20.5	18.0	19.0
14	18.0	17.0	17.5	23.0	22.0	22.5	23.0	22.0	22.5	18.0	17.5	17.5
15	17.5	17.0	17.0	23.0	22.5	23.0	23.5	22.5	23.0	18.0	17.5	18.0
16	18.5	18.0	18.0	23.0	22.0	22.5	23.5	22.0	23.0	18.0	17.5	17.5
17	18.5	18.0	18.5	22.5	21.5	22.0	22.0	21.0	21.5	17.5	17.5	17.5
18	19.5	18.5	19.0	23.0	22.5	22.5	22.5	21.5	22.0	17.5	17.0	17.5
19	20.0	18.5	19.0	23.0	22.5	22.5	22.5	21.5	22.0	18.0	17.0	17.5
20	20.5	19.5	20.0	23.5	22.5	23.0	21.5	21.0	21.0	18.5	18.0	18.0
21	20.5	19.5	20.0	22.5	22.0	22.5	21.5	21.0	21.0	18.0	17.0	17.5
22	20.0	19.0	19.5	22.5	22.0	22.0	21.5	20.5	21.0	17.0	16.5	17.0
23	20.0	19.0	20.0	22.5	22.0	22.0	21.5	21.0	21.5	16.5	16.0	16.5
24	20.5	19.0	19.5	22.5	22.0	22.0	22.5	21.5	21.5	17.5	16.0	16.5
25	21.0	18.5	20.5	22.5	22.0	22.0	22.0	21.5	21.5	17.0	16.0	16.5
26	22.0	21.0	21.5	22.5	22.0	22.5	22.0	21.0	21.5	16.0	16.0	16.0
27	22.0	21.5	22.0	22.0	21.5	22.0	21.5	21.5	21.5	16.5	16.0	16.0
28	22.5	21.5	22.0	21.5	21.0	21.0	21.5	21.0	21.5	16.0	15.5	16.0
29	22.5	21.5	22.0	21.5	20.5	21.0	21.5	21.0	21.0	16.0	15.0	15.5
30	23.5	22.0	22.5	20.5	20.0	20.5	21.5	21.0	21.0	16.0	15.0	15.5
31	---	---	---	20.5	20.0	20.0	21.0	20.0	20.5	---	---	---
MONTH	23.5	17.0	19.5	23.5	20.0	22.0	23.5	19.5	21.0	22.0	15.0	18.5

## STREAMS TRIBUTARY TO LAKE MICHIGAN

235

## 04127000 BOARDMAN RIVER NEAR MAYFIELD, MI

LOCATION.--Lat 44°38'18", long 85°31'10", in SE¼ NE¼ sec.21, T.26 N., R.10 W., Grand Traverse County, Hydrologic Unit 04060105, on right bank 25 ft (8 m) downstream from Brown's Bridge, 300 ft (91 m) downstream from East Creek, 0.9 mi (1.4 km) downstream from Brown's Bridge Dam, 1.0 mi (1.6 km) northeast of Mayfield, and 9.6 mi (15.4 km) southeast of Traverse City.

DRAINAGE AREA.--223 mi<sup>2</sup> (578 km<sup>2</sup>).

PERIOD OF RECORD.--June 1952 to current year.

GAGE.--Water-stage recorder. Altitude of gage is 760 ft (230 m), by barometer.

REMARKS.--Records good. Flow regulated by hydroelectric powerplant 0.9 mi (1.4 km) above station.

AVERAGE DISCHARGE.--26 years, 193 ft<sup>3</sup>/s (5.466 m<sup>3</sup>/s), 11.75 in/yr (298 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,220 ft<sup>3</sup>/s (34.6 m<sup>3</sup>/s) Sept. 14, 1961, gage height, 6.90 ft (2.103 m); minimum, 30 ft<sup>3</sup>/s (0.85 m<sup>3</sup>/s) Jan. 15, 1965, gage height, 2.53 ft (0.771 m); minimum daily, 47 ft<sup>3</sup>/s (1.33 m<sup>3</sup>/s) Nov. 2, 3, 1963.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 445 ft<sup>3</sup>/s (12.6 m<sup>3</sup>/s) May 14, gage height, 4.70 ft (1.433 m); minimum, 54 ft<sup>3</sup>/s (1.53 m<sup>3</sup>/s) Aug. 10, gage height, 2.74 ft (0.835 m); minimum daily, 123 ft<sup>3</sup>/s (3.48 m<sup>3</sup>/s) Sept. 9, 10.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	172	160	217	179	186	169	206	235	193	167	154	146
2	168	157	215	179	185	167	251	236	181	168	155	145
3	163	150	200	178	174	168	253	235	155	171	157	142
4	163	174	193	179	162	166	260	225	156	174	152	142
5	167	199	201	177	168	167	259	216	177	174	143	142
6	167	177	209	177	164	166	277	216	194	172	143	140
7	165	155	206	177	164	166	331	216	211	175	142	140
8	175	152	201	177	164	170	334	212	217	177	142	130
9	179	167	195	164	166	168	313	210	208	176	144	123
10	185	193	178	162	168	179	329	212	195	169	139	123
11	205	191	175	162	168	203	374	213	192	167	140	124
12	217	183	180	161	168	201	378	242	190	166	140	135
13	207	181	180	157	168	186	406	317	195	163	139	135
14	201	175	185	148	168	175	388	414	192	161	138	208
15	199	168	184	148	168	174	352	371	191	161	138	268
16	197	175	173	155	168	173	334	307	187	160	142	268
17	183	173	156	160	176	169	315	298	190	157	143	273
18	168	177	167	162	190	165	294	275	206	153	142	294
19	168	181	223	165	189	166	294	244	198	154	144	250
20	167	199	264	173	187	165	294	244	195	154	141	221
21	167	235	268	178	184	166	287	243	197	161	139	221
22	167	221	257	178	183	167	280	229	194	169	138	191
23	165	193	219	184	182	172	278	213	179	164	138	179
24	165	192	206	188	180	171	280	212	168	161	139	177
25	167	190	202	188	179	170	279	213	169	158	144	175
26	167	187	199	185	176	168	273	208	169	159	149	154
27	167	189	187	185	174	181	248	194	166	160	151	131
28	167	187	149	190	169	199	223	192	166	157	153	132
29	165	186	150	188	---	204	230	193	166	158	155	138
30	165	184	162	188	---	165	230	193	166	155	149	146
31	162	---	179	186	---	203	---	192	---	154	147	---
TOTAL	5440	5451	6100	5378	4878	5462	8850	7420	5567	5075	4480	5143
MEAN	175	182	197	173	174	176	295	239	186	164	145	173
MAX	217	235	268	190	190	204	406	414	217	177	157	294
MIN	162	150	149	148	162	165	206	192	155	153	138	123
CFSM	.79	.82	.88	.78	.78	.79	1.32	1.07	.93	.74	.65	.78
IN.	.91	.91	1.02	.90	.81	.91	1.48	1.24	.93	.85	.75	.87

CAL YR 1977 TOTAL 67617 MEAN 185 MAX 520 MIN 112 CFSM .83 IN 11.28  
WTR YR 1978 TOTAL 69294 MEAN 190 MAX 414 MIN 123 CFSM .85 IN 11.56



## STREAMS TRIBUTARY TO LAKE MICHIGAN

04127800 JORDAN RIVER NEAR EAST JORDAN, MI

LOCATION.--Lat 45°06'09", long 85°05'53", in NW¼ NW¼ sec.7, T.31 N., R.6 W., Antrim County, Hydrologic Unit 04060105, on right bank 600 ft (183 m) downstream from Webster Bridge, 4.2 mi (6.8 km) south of East Jordan and 4.5 mi (7.2 km) upstream from mouth.

DRAINAGE AREA.--67.6 mi<sup>2</sup> (175 km<sup>2</sup>).

## WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--Occasional low-flow measurements, water years 1960-65. October 1966 to current year.

GAGE.--Water-stage recorder. Altitude of gage is 610 ft (186 m), from topographic map. Nov. 19, 1959, to Sept. 30, 1966, nonrecording gage at present site and at site 600 ft (183 m) upstream at same datum.

REMARKS.--Water-discharge records good except those for the winter period, which are poor. Some regulation during low flows by fish hatchery above station.

AVERAGE DISCHARGE.--12 years, 188 ft<sup>3</sup>/s (5.324 m<sup>3</sup>/s), 37.77 in/yr (959 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,360 ft<sup>3</sup>/s (38.5 m<sup>3</sup>/s) July 19, 1975, gage height, 6.51 ft (1.984 m); minimum, 109 ft<sup>3</sup>/s (3.09 m<sup>3</sup>/s) Mar. 1, 8, 1967, result of freezeup.

EXTREMES FOR CURRENT YEAR.--Peak discharges above base of 400 ft<sup>3</sup>/s (11.3 m<sup>3</sup>/s) and maximum (\*):

Date	Time	Discharge (ft <sup>3</sup> /s) (m <sup>3</sup> /s)	Gage height (ft) (m)	Date	Time	Discharge (ft <sup>3</sup> /s) (m <sup>3</sup> /s)	Gage height (ft) (m)
Dec. 1	1900	408 11.6	4.61 1.405	May 30	2400	420 11.9	4.66 1.420
Apr. 7	0100	408 11.6	4.76 1.451	Sept. 14	1800	408 11.6	4.61 1.405
Apr. 11	0400	514 14.6	5.11 1.558	Sept. 18	2400	*810 22.9	*5.58 1.701

Minimum discharge, 154 ft<sup>3</sup>/s (4.36 m<sup>3</sup>/s) Feb. 19, gage height, 2.99 ft (0.911 m), result of freezeup.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	185	185	313	210	190	185	266	189	199	164	164	168
2	179	195	279	210	190	185	221	188	189	165	208	167
3	177	216	219	210	190	185	198	186	184	164	208	169
4	175	245	206	210	190	185	210	186	183	163	171	167
5	190	195	198	205	190	185	233	186	184	162	167	170
6	185	196	194	205	190	180	276	186	179	163	165	169
7	177	206	194	205	185	182	347	185	176	163	163	167
8	235	195	198	210	185	182	277	191	181	165	164	169
9	246	191	196	190	185	180	229	206	178	165	187	170
10	206	209	195	190	185	181	365	206	173	166	168	168
11	207	223	195	190	185	184	408	191	173	164	165	201
12	305	207	195	190	190	184	303	254	225	163	164	204
13	227	182	196	190	190	184	293	278	193	165	164	177
14	197	191	204	190	193	188	241	258	179	164	163	297
15	189	195	203	190	194	182	229	220	177	163	162	245
16	186	200	211	185	192	180	223	200	178	164	185	182
17	183	193	220	185	192	180	225	195	178	163	184	231
18	183	243	248	180	190	178	228	190	179	164	170	392
19	182	223	236	180	190	179	246	188	174	170	180	422
20	180	265	240	180	190	176	235	186	172	167	174	206
21	179	249	226	180	190	179	217	184	177	182	167	197
22	178	206	203	175	190	181	210	182	175	189	166	185
23	177	199	198	175	190	186	209	183	170	217	168	180
24	185	202	196	175	188	179	210	183	170	176	179	177
25	185	198	200	180	189	175	205	180	169	166	175	175
26	185	196	200	180	187	175	201	207	171	166	171	175
27	184	195	200	180	187	176	192	199	169	168	184	196
28	185	194	205	180	187	191	186	184	166	166	193	184
29	184	194	205	190	---	198	184	180	166	174	188	180
30	183	194	205	190	---	185	190	240	165	168	172	200
31	183	---	205	190	---	204	---	278	---	164	168	---
TOTAL	6002	6182	6585	5900	5294	5674	7247	6269	5352	5223	5407	6090
MEAN	194	206	212	190	189	183	242	202	178	168	174	203
MAX	305	265	313	210	194	204	408	278	225	217	208	422
MIN	175	182	194	175	185	175	184	180	165	162	162	167
CFSM	2.87	3.05	3.14	2.81	2.80	2.71	3.58	2.99	2.63	2.49	2.57	3.00
IN.	3.30	3.40	3.62	3.25	2.91	3.12	3.99	3.45	2.95	2.87	2.98	3.35

CAL YR 1977	TOTAL	73455	MEAN	201	MAX	548	MIN	164	CFSM	2.97	IN	40.42
WTR YR 1978	TOTAL	71225	MEAN	195	MAX	422	MIN	162	CFSM	2.89	IN	39.19

## STREAMS TRIBUTARY TO LAKE MICHIGAN

237

04127800 JORDAN RIVER NEAR EAST JORDAN, MI--CONTINUED

## WATER-QUALITY RECORDS

## PERIOD OF DAILY RECORD.--

WATER TEMPERATURES: October 1966 to current year.

INSTRUMENTATION.--Temperature recorder since October 1966.

## EXTREMES FOR PERIOD OF DAILY RECORD.--

WATER TEMPERATURES: Maximum, 20.0°C July 11, 1976; minimum, 0.0°C on many days during winter periods.

## EXTREMES FOR CURRENT YEAR.--

WATER TEMPERATURES: Maximum, 17.5°C June 27-30, July 6, 7; minimum, 1.5°C on many days during winter period.

## TEMPERATURE (DEG. C) OF WATER, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DAY	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN
	OCTOBER		NOVEMBER		DECEMBER		JANUARY		FEBRUARY		MARCH	
1	10.5	10.5	10.5	9.0	2.5	2.5	1.5	1.5	1.5	1.5	2.0	1.5
2	10.5	9.0	11.0	10.5	2.5	2.5	1.5	1.5	1.5	1.5	1.5	1.5
3	9.5	9.0	11.0	11.0	2.5	2.5	1.5	1.5	1.5	1.5	2.0	1.5
4	9.0	8.5	10.5	9.5	2.5	2.5	1.5	1.5	1.5	1.5	2.0	1.5
5	9.5	9.0	9.5	7.5	2.5	2.5	1.5	1.5	1.5	1.5	1.5	1.5
6	9.5	9.5	9.0	8.0	2.5	2.0	1.5	1.5	1.5	1.5	2.0	1.5
7	9.5	8.0	9.5	9.0	2.0	2.0	2.5	1.5	1.5	1.5	1.5	1.5
8	9.0	8.0	9.5	9.5	2.0	1.5	2.5	2.0	1.5	1.5	1.5	1.5
9	9.0	9.0	10.5	9.5	1.5	1.5	2.0	1.5	1.5	1.5	1.5	1.5
10	9.0	7.0	10.5	9.0	1.5	1.5	1.5	1.5	1.5	1.5	2.0	1.5
11	9.0	9.0	9.0	5.5	1.5	1.5	1.5	1.5	1.5	1.5	3.0	2.0
12	9.0	8.5	5.5	5.0	1.5	1.5	1.5	1.5	1.5	1.5	3.0	2.5
13	8.5	8.0	5.0	5.0	2.5	1.5	1.5	1.5	1.5	1.5	3.0	2.5
14	9.5	8.0	5.0	5.0	3.0	2.5	1.5	1.5	1.5	1.5	3.0	2.0
15	9.5	9.0	5.0	5.0	3.5	3.0	1.5	1.5	1.5	1.5	3.0	2.0
16	9.5	8.5	5.5	5.0	3.5	3.5	1.5	1.5	1.5	1.5	2.5	2.0
17	8.5	7.0	5.0	5.0	3.5	3.5	1.5	1.5	1.5	1.5	2.5	2.0
18	8.5	7.5	4.5	4.5	3.5	3.5	1.5	1.5	1.5	1.5	3.5	1.5
19	8.5	8.0	4.5	4.5	3.5	3.5	1.5	1.5	1.5	1.5	3.0	2.0
20	8.5	8.0	4.5	4.5	3.5	3.5	1.5	1.5	1.5	1.5	3.5	2.5
21	9.5	9.0	4.5	4.5	3.5	3.0	1.5	1.5	1.5	1.5	3.5	3.0
22	9.5	9.5	4.5	4.0	3.0	3.0	1.5	1.5	1.5	1.5	4.5	3.5
23	9.5	8.5	4.0	3.5	3.0	3.0	1.5	1.5	1.5	1.5	5.0	4.5
24	9.5	8.5	3.5	3.5	3.0	3.0	1.5	1.5	1.5	1.5	5.0	3.0
25	11.0	9.5	3.5	2.5	3.0	1.5	2.5	1.5	2.5	1.5	3.5	2.5
26	11.0	11.0	2.5	2.0	1.5	1.5	2.5	1.5	2.5	2.0	3.0	3.0
27	11.0	10.0	2.0	2.0	1.5	1.5	1.5	1.5	2.5	2.5	4.5	3.0
28	9.5	9.5	2.0	2.0	1.5	1.5	1.5	1.5	2.5	2.0	5.0	4.5
29	9.5	8.5	2.5	2.0	1.5	1.5	1.5	1.5	---	---	5.0	4.0
30	8.5	8.5	2.5	2.5	1.5	1.5	1.5	1.5	---	---	4.0	4.0
31	9.5	8.5	---	---	1.5	1.5	1.5	1.5	---	---	4.5	4.0
MONTH	11.0	7.0	11.0	2.0	3.5	1.5	2.5	1.5	2.5	1.5	5.0	1.5

STREAMS TRIBUTARY TO LAKE MICHIGAN  
04127800 JORDAN RIVER NEAR EAST JORDAN, MI--CONTINUED

TEMPERATURE (DEG. C) OF WATER, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DAY	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN
	APRIL		MAY		JUNE		JULY		AUGUST		SEPTEMBER	
1	4.0	3.0	7.5	6.0	14.0	13.5	16.0	14.5	13.0	11.5	12.0	10.0
2	3.5	2.5	8.0	6.0	14.0	13.0	14.5	13.5	13.0	12.0	12.5	12.0
3	2.5	2.5	8.0	6.0	13.0	10.5	15.5	13.0	12.5	11.0	12.5	12.5
4	3.0	2.5	8.5	7.0	12.5	11.0	15.0	13.0	12.0	10.0	12.5	10.5
5	4.0	3.0	9.5	7.5	13.5	11.0	15.0	13.0	12.5	10.5	11.5	10.5
6	4.0	3.0	10.0	8.0	15.0	11.5	17.5	15.0	13.5	11.5	13.0	11.5
7	4.0	3.0	10.0	8.0	15.0	14.0	17.5	16.0	13.5	12.0	13.0	13.0
8	3.5	2.5	10.0	10.0	14.5	13.0	16.0	14.5	14.0	12.0	13.0	12.5
9	3.5	3.0	10.0	8.5	14.0	12.0	14.5	13.0	14.0	13.0	12.5	12.0
10	3.0	2.5	9.5	8.0	14.0	10.5	14.0	13.0	14.0	11.0	13.0	12.0
11	3.0	2.5	12.0	9.0	15.5	14.0	13.0	10.5	13.0	11.0	13.5	13.0
12	3.5	2.5	12.0	11.0	15.0	12.5	13.5	11.0	13.5	12.0	13.5	11.0
13	3.5	3.5	11.0	10.0	12.5	10.5	14.5	13.5	14.5	12.5	11.5	10.5
14	4.0	3.5	10.5	10.5	12.0	10.0	14.5	12.5	15.0	13.0	11.5	10.5
15	4.0	3.5	12.5	10.5	12.0	11.0	15.5	13.5	15.0	13.5	11.5	11.0
16	5.0	3.0	12.5	12.0	12.5	12.5	15.0	11.5	15.0	14.0	12.0	11.0
17	6.0	3.5	13.0	10.0	14.0	12.5	14.0	11.5	14.0	12.5	11.0	11.0
18	6.0	5.0	14.5	12.5	15.0	14.0	14.5	13.5	13.5	12.5	11.0	11.0
19	5.0	5.0	15.5	13.0	15.0	13.0	14.0	13.5	13.0	13.0	12.5	11.0
20	5.0	5.0	15.5	13.5	15.0	13.0	14.5	13.5	13.0	11.5	12.0	12.0
21	6.0	4.5	13.5	11.0	15.5	14.0	14.0	13.5	12.5	10.5	12.0	11.0
22	6.0	4.5	13.5	11.0	15.0	12.5	13.5	13.0	12.5	11.5	11.0	9.5
23	6.5	5.5	13.5	11.5	15.0	12.5	14.5	13.0	12.5	12.0	9.5	9.0
24	8.5	6.5	14.5	12.0	15.0	12.5	14.0	12.0	12.0	11.5	10.5	9.5
25	8.5	6.5	15.0	12.5	15.0	14.0	14.0	12.5	11.5	11.5	10.5	9.5
26	8.5	7.0	15.0	13.5	16.0	14.0	14.0	13.5	12.5	11.5	9.5	9.0
27	8.5	6.5	17.0	14.0	17.5	15.5	13.5	12.0	12.5	12.5	10.5	9.5
28	10.0	7.5	16.0	15.5	17.5	14.5	12.0	10.0	12.5	12.5	10.5	8.5
29	10.0	8.5	17.0	15.0	17.5	14.5	12.0	12.0	13.0	12.0	8.0	8.0
30	10.0	7.0	16.0	15.0	17.5	15.0	12.0	10.0	13.0	11.5	9.0	8.0
31	---	---	15.0	15.0	---	---	12.0	10.0	12.5	10.0	---	---
MONTH	10.0	2.5	17.0	6.0	17.5	10.0	17.5	10.0	15.0	10.0	13.5	8.0

## STREAMS TRIBUTARY TO LAKE HURON

239

04127918 PINE RIVER NEAR RUDYARD, MI

LOCATION.--Lat 46°11'09", long 84°35'52", in NW¼ NE¼ sec.30, T.44 N., R.2 W., Chippewa County, Hydrologic Unit 04070002, on right bank 15 ft (5 m) upstream from county highway bridge, 3.2 mi (5.1 km) south of Rudyard.

DRAINAGE AREA.--184 mi<sup>2</sup> (477 km<sup>2</sup>).

PERIOD OF RECORD.--April 1972 to current year.

GAGE.--Water-stage recorder. Altitude of gage is 600 ft (183 m) from topographic map (nearest 10 ft). Prior to Aug. 4, 1972, non-recording gage at same site and datum.

REMARKS.--Records good except those for the winter period, which are fair. Several observations of water temperature were made during the year.

AVERAGE DISCHARGE.--6 years, 235 ft<sup>3</sup>/s (6.655 m<sup>3</sup>/s), 17.34 in/yr (440 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 4,190 ft<sup>3</sup>/s (119 m<sup>3</sup>/s) June 18, 1975, gage height, 17.62 ft (5.371 m); minimum, 56 ft<sup>3</sup>/s (1.59 m<sup>3</sup>/s) July 28, 1977, gage height, 1.86 ft (0.567 m).

EXTREMES OUTSIDE PERIOD OF RECORD.--A discharge of 50.3 ft<sup>3</sup>/s (1.42 m<sup>3</sup>/s) was measured Aug. 6, 1963.

EXTREMES FOR CURRENT YEAR.--Peak discharges above base of 1,200 ft<sup>3</sup>/s (34.0 m<sup>3</sup>/s) and maximum (\*):

Date	Time	Discharge (ft <sup>3</sup> /s) (m <sup>3</sup> /s)	Gage Height (ft) (m)	Date	Time	Discharge (ft <sup>3</sup> /s) (m <sup>3</sup> /s)	Gage height (ft) (m)
Nov. 21	0300	1,240 35.1	7.04 2.146	May 14	0700	*2,370 67.1	11.49 3.502
Apr. 18	0100	ice jam	*11.86 3.615	Sept. 14	2300	1,570 44.5	8.29 2.527
Apr. 20	0200	1,860 52.7	9.44 2.877				

Minimum discharge, 71 ft<sup>3</sup>/s (2.01 m<sup>3</sup>/s) Aug. 16, 22, 23, gage height, 2.01 ft (0.613 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	218	118	210	130	90	72	220	394	129	98	112	162
2	180	248	200	125	85	72	240	328	125	93	112	144
3	152	489	185	125	85	72	260	291	120	89	107	190
4	136	772	175	120	80	72	290	271	121	84	99	194
5	127	485	165	120	80	72	325	255	133	85	94	162
6	132	328	155	120	80	72	360	241	131	82	89	143
7	128	275	145	120	80	75	380	225	120	82	86	139
8	277	264	145	120	75	75	400	238	116	82	84	181
9	644	260	140	120	75	75	410	383	117	83	82	164
10	474	670	140	115	75	75	425	360	113	84	77	197
11	456	675	140	115	75	80	450	299	108	83	75	457
12	458	548	140	115	72	80	500	1360	498	83	74	419
13	342	370	145	115	72	80	580	1690	462	80	73	265
14	266	285	150	115	72	80	680	2190	284	82	73	645
15	229	290	230	115	72	80	780	1810	221	80	73	1270
16	201	322	255	110	72	80	920	1080	205	78	73	741
17	180	292	289	110	72	80	1150	636	212	76	76	403
18	168	264	307	110	72	80	1400	419	194	84	74	292
19	162	246	300	110	72	80	1500	312	172	150	74	288
20	153	405	270	110	72	80	1610	264	151	300	81	374
21	146	958	240	110	72	80	1210	238	138	280	77	394
22	144	458	210	110	72	80	1140	214	135	400	72	279
23	134	298	190	105	72	80	1190	194	126	640	80	226
24	131	260	180	100	72	80	1140	177	118	400	153	194
25	127	250	170	100	72	85	1080	167	112	255	144	177
26	127	230	160	95	72	100	978	151	108	186	126	161
27	125	220	155	95	72	120	854	146	109	156	116	199
28	124	200	150	95	72	135	744	133	108	133	343	225
29	120	190	145	90	---	150	653	128	109	135	442	221
30	116	195	140	90	---	170	515	123	101	138	285	620
31	114	---	135	90	---	200	---	132	---	116	201	---
TOTAL	6491	10865	5761	3420	2104	2812	22384	14849	4896	4797	3727	9528
MEAN	209	362	186	110	75.1	90.7	746	479	163	155	120	318
MAX	644	958	307	130	90	200	1610	2190	498	640	442	1270
MTN	114	118	135	90	72	72	220	123	101	76	72	139
CFSM	1.14	1.97	1.01	.60	.41	.49	4.05	2.60	.89	.84	.65	1.73
IN.	1.31	2.20	1.16	.69	.43	.57	4.53	3.00	.99	.97	.75	1.93

CAL YR 1977	TOTAL	83538	MEAN	229	MAX	1950	MIN	57	CFSM	1.25	IN	16.89
WTR YR 1978	TOTAL	91634	MEAN	251	MAX	2190	MIN	72	CFSM	1.36	IN	18.53

## STREAMS TRIBUTARY TO LAKE HURON

04128000 STURGEON RIVER NEAR WOLVERINE, MI

LOCATION.--Lat 45°17'56", long 84°36'40", in SE¼ NE¼ sec.36, T.34 N., R.3 W., Cheboygan County, Hydrologic Unit 04070004, on left bank 1.8 mi (2.9 km) north of Wolverine, 2.8 mi (4.5 km) downstream from West Branch, and 9 mi (14 km) upstream from mouth.

DRAINAGE AREA.--170 mi<sup>2</sup> (440 km<sup>2</sup>), approximately.

## WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--April 1942 to current year.

REVISED RECORDS.--WSP 1307: 1944 (M), 1948 (M). WSP 1727: 1951 (M).

GAGE.--Water-stage recorder. Altitude of gage is 740 ft (226 m), from topographic map. Prior to June 15, 1942, nonrecording gage at site 1.0 mi (1.6 km) upstream, and June 16, 1942, to Sept. 30, 1958, at site 0.7 mi (1.1 km) upstream at different datums.

REMARKS.--Water-discharge records good except those for the winter period, which are poor. Prior to July 1975 intermittent regulation at low flows by ponds 2.4 mi (3.9 km) above station.

AVERAGE DISCHARGE.--36 years, 218 ft<sup>3</sup>/s (6.174 m<sup>3</sup>/s), 17.41 in/yr (442 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,290 ft<sup>3</sup>/s (36.5 m<sup>3</sup>/s) Sept. 29, 1972, gage height, 3.72 ft (1.134 m); minimum, 94 ft<sup>3</sup>/s (2.66 m<sup>3</sup>/s) Jan. 19, 1971, result of freezeup; minimum daily, 113 ft<sup>3</sup>/s (3.20 m<sup>3</sup>/s) Aug. 6, 1958.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 610 ft<sup>3</sup>/s (17.3 m<sup>3</sup>/s) Apr. 11, gage height, 2.78 ft (0.847 m); minimum, 152 ft<sup>3</sup>/s (4.30 m<sup>3</sup>/s) Aug. 15, 16, gage height, 1.67 ft (0.509 m); minimum gage height, 1.63 ft (0.497 m) Jan. 26, Mar. 2, result of freezeup.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	254	208	356	250	180	210	300	268	221	176	173	167
2	230	218	394	240	180	210	290	262	218	173	191	165
3	218	221	293	240	180	210	268	230	214	171	227	162
4	211	251	265	235	180	210	268	224	211	171	189	162
5	221	227	248	230	180	210	279	230	214	171	176	162
6	224	218	237	230	180	210	328	214	208	169	171	160
7	214	224	227	220	180	210	425	208	202	167	167	158
8	286	227	230	215	180	210	402	218	214	171	165	156
9	344	221	230	211	180	214	348	265	208	173	186	160
10	293	230	230	210	180	214	448	276	202	181	173	160
11	268	251	240	210	185	214	575	265	194	171	167	272
12	316	244	240	210	185	214	520	312	208	169	160	312
13	312	227	240	210	190	214	461	425	214	171	160	214
14	262	221	240	205	190	214	402	438	208	171	156	356
15	251	221	240	200	190	214	360	360	199	169	152	461
16	240	230	240	195	190	214	340	293	194	169	171	293
17	230	224	254	190	190	214	360	276	196	165	191	224
18	227	244	320	185	185	214	380	254	202	169	173	336
19	224	268	304	180	185	214	394	248	191	171	169	510
20	221	300	300	180	185	205	416	237	186	176	169	352
21	221	352	296	180	190	214	360	230	189	205	162	282
22	218	282	262	180	190	214	340	224	189	221	158	234
23	214	251	248	180	190	218	340	218	183	296	158	214
24	214	251	237	180	200	211	340	218	183	208	199	205
25	214	237	234	185	210	214	352	211	186	189	189	190
26	214	240	250	185	214	211	340	218	194	181	173	186
27	211	227	250	185	214	208	324	254	186	181	176	208
28	211	224	250	185	214	221	316	227	183	178	221	214
29	208	221	250	185	---	230	308	218	181	191	214	199
30	208	221	255	185	---	230	286	218	178	191	181	227
31	205	---	250	185	---	230	---	237	---	176	171	---
TOTAL	7384	7181	8110	6261	5297	6640	10870	7976	5956	5641	5488	7101
MEAN	238	239	262	202	189	214	362	257	199	182	177	237
MAX	344	352	394	250	214	230	575	438	221	296	227	510
MIN	205	208	227	180	180	205	268	208	178	165	152	156
CFSM	1.40	1.41	1.54	1.19	1.11	1.26	2.13	1.51	1.17	1.07	1.04	1.39
IN.	1.62	1.57	1.77	1.37	1.16	1.45	2.38	1.75	1.30	1.23	1.20	1.55

CAL YR 1977 TOTAL 87411 MEAN 239 MAX 710 MIN 158 CFSM 1.41 IN 19.13  
WTR YR 1978 TOTAL 83905 MEAN 230 MAX 575 MIN 152 CFSM 1.35 IN 18.36



## STREAMS TRIBUTARY TO LAKE HURON

241

04128000 STURGEON RIVER NEAR WOLVERINE, MI--CONTINUED

## WATER-QUALITY RECORDS

## PERIOD OF DAILY RECORD.--

WATER TEMPERATURES: October 1958 to current year.

INSTRUMENTATION.--Temperature recorder since October 1958.

## EXTREMES FOR PERIOD OF DAILY RECORD.--

WATER TEMPERATURES: Maximum, 24.0°C June 30, 1964; minimum, 0.0°C on many days during winter periods.

## EXTREMES FOR CURRENT YEAR.--

WATER TEMPERATURES: Maximum, 21.0°C July 6, 7; minimum, 0.0°C on many days during winter period.

## TEMPERATURE (DEG. C) OF WATER, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DAY	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN
	OCTOBER		NOVEMBER		DECEMBER		JANUARY		FEBRUARY		MARCH	
1	11.0	10.5	9.0	8.0	1.0	1.0	.0	.0	.0	.0	.0	.0
2	10.5	9.0	10.0	9.0	1.0	.5	.0	.0	.0	.0	.0	.0
3	9.5	9.0	10.0	10.0	.5	.5	.0	.0	.0	.0	.0	.0
4	9.5	8.5	10.0	9.0	.5	.5	.0	.0	.0	.0	.0	.0
5	9.5	9.5	9.0	7.5	.5	.5	.0	.0	.0	.0	.0	.0
6	9.5	9.0	8.0	7.5	.5	.5	.0	.0	.0	.0	.0	.0
7	9.0	8.5	9.0	8.0	.5	.5	.0	.0	.0	.0	.0	.0
8	8.5	8.5	9.5	9.0	.5	.5	.5	.0	.0	.0	.0	.0
9	8.5	8.5	10.0	9.5	.5	.5	.0	.0	.0	.0	.0	.0
10	8.5	8.0	10.0	8.5	.5	.5	.0	.0	.0	.0	.5	.0
11	8.5	8.5	8.0	6.5	.5	.0	.0	.0	.0	.0	3.0	.5
12	8.5	8.0	6.5	5.5	.0	.0	.0	.0	.0	.0	3.0	2.0
13	8.0	8.0	5.5	5.0	.0	.0	.0	.0	.0	.0	3.0	2.5
14	8.0	8.0	5.0	5.0	.0	.0	.0	.0	.0	.0	3.0	2.5
15	8.0	8.0	5.0	5.0	1.5	.0	.0	.0	.0	.0	3.0	2.0
16	8.0	7.5	5.0	4.5	1.5	1.5	.0	.0	.0	.0	2.5	2.0
17	7.5	7.0	4.5	4.5	1.5	1.5	.0	.0	.0	.0	2.0	2.0
18	7.5	7.0	4.5	4.5	1.5	1.5	.0	.0	.0	.0	3.0	1.0
19	8.0	7.5	4.5	4.5	1.5	1.5	.0	.0	.0	.0	2.0	2.0
20	8.0	7.5	4.5	4.0	1.5	1.5	.0	.0	.0	.0	2.0	1.0
21	9.0	8.0	4.0	3.5	1.5	1.0	.0	.0	.0	.0	2.0	1.0
22	8.5	8.0	3.5	3.5	1.0	1.0	.0	.0	.0	.0	2.5	2.0
23	8.0	7.0	3.5	3.0	1.0	1.0	.0	.0	.0	.0	4.0	3.0
24	7.5	7.0	3.0	3.0	1.0	1.0	.0	.0	.0	.0	3.0	2.0
25	9.5	7.5	3.0	2.5	1.0	.0	.0	.0	.0	.0	2.0	1.0
26	10.0	9.5	2.0	1.0	.0	.0	.0	.0	.0	.0	2.0	2.0
27	10.0	8.5	1.0	1.0	.0	.0	.0	.0	.0	.0	4.0	2.0
28	8.5	8.0	1.0	1.0	.0	.0	.0	.0	.0	.0	4.5	4.0
29	8.5	7.5	1.5	1.0	.0	.0	.0	.0	---	---	4.5	3.0
30	7.5	7.5	1.5	1.0	.0	.0	.0	.0	---	---	3.5	2.5
31	8.0	7.0	---	---	.0	.0	.0	.0	---	---	4.0	3.0
MONTH	11.0	7.0	10.0	1.0	1.5	.0	.5	.0	.0	.0	4.5	.0

STREAMS TRIBUTARY TO LAKE HURON  
04128000 STURGEON RIVER NEAR WOLVERINE, MI--CONTINUED

TEMPERATURE (DEG. C) OF WATER, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DAY	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN
	APRIL		MAY		JUNE		JULY		AUGUST		SEPTEMBER	
1	3.5	3.0	8.0	6.0	15.5	13.0	18.5	16.0	17.0	13.5	13.0	12.0
2	3.5	2.0	8.5	6.0	15.5	13.0	17.5	15.0	16.5	14.5	14.5	13.0
3	3.0	2.0	9.0	6.0	13.5	12.0	18.0	15.0	15.0	13.0	14.5	13.5
4	2.5	2.0	9.0	7.0	13.5	12.0	18.0	15.0	15.0	13.0	14.0	12.0
5	5.0	2.5	9.5	7.0	14.0	12.0	19.0	15.0	16.0	13.0	13.0	12.0
6	4.0	3.0	9.0	7.5	16.0	12.0	21.0	17.0	17.0	13.5	15.0	13.0
7	3.0	3.0	11.0	7.5	16.0	13.5	21.0	18.5	17.0	14.5	15.0	13.5
8	4.0	2.5	10.5	9.0	15.0	12.0	18.5	16.5	18.0	14.5	13.5	12.5
9	3.0	2.5	9.0	8.0	15.0	12.0	17.5	15.0	18.0	15.5	13.5	12.0
10	2.5	2.0	10.0	7.0	14.5	11.0	16.5	15.0	17.0	13.5	14.5	12.0
11	2.0	2.0	12.0	8.0	16.0	13.0	16.0	14.5	16.0	13.0	14.5	13.5
12	2.0	2.0	12.0	11.0	16.0	13.0	17.5	15.0	17.0	14.0	14.5	12.5
13	3.0	3.0	11.0	9.0	13.0	11.0	18.5	16.0	17.5	14.0	12.5	11.5
14	3.5	3.0	9.5	9.0	13.0	11.0	19.0	15.5	18.0	15.0	11.5	11.0
15	3.5	3.0	12.0	9.0	13.5	11.5	18.5	16.5	18.0	15.5	12.0	11.0
16	5.0	3.0	12.0	11.0	14.0	12.5	18.5	15.5	17.5	16.0	12.0	11.5
17	6.0	3.5	15.0	10.5	16.0	13.0	18.0	15.5	16.5	14.5	11.5	11.0
18	6.0	4.5	16.0	12.0	17.5	14.5	18.0	16.5	16.5	14.5	11.0	10.5
19	4.5	4.5	17.5	13.0	17.5	13.5	17.5	16.5	15.5	15.0	11.0	10.5
20	4.5	4.0	17.0	14.5	17.0	13.5	19.5	17.0	15.0	12.5	11.5	11.0
21	6.0	3.5	15.0	12.0	16.5	14.5	19.5	17.0	15.5	12.5	11.5	11.5
22	7.0	4.0	15.0	11.0	16.0	12.5	18.0	16.0	15.5	13.0	11.5	9.5
23	7.0	5.0	15.0	11.5	16.0	12.5	18.0	16.0	15.5	14.0	9.5	9.0
24	8.0	5.0	16.0	12.0	16.5	12.5	17.5	14.5	14.0	13.5	10.5	9.5
25	8.0	5.5	16.0	12.0	16.5	14.5	17.5	15.0	13.5	13.0	10.5	9.5
26	8.0	5.5	16.0	13.5	18.5	15.5	17.5	16.5	14.5	13.0	10.0	9.5
27	9.0	6.0	18.0	14.0	19.0	16.5	17.5	15.5	14.5	13.5	9.5	9.5
28	10.0	6.5	18.5	15.5	19.0	16.0	16.0	14.0	13.5	13.5	9.5	9.0
29	10.0	8.0	18.5	16.0	20.0	16.5	16.0	14.5	15.0	13.0	9.0	9.0
30	9.0	6.5	18.0	16.0	20.0	16.0	15.5	13.5	15.0	13.0	9.0	9.0
31	---	---	16.0	15.0	---	---	15.5	13.5	15.0	12.5	---	---
MONTH	10.0	2.0	18.5	6.0	20.0	11.0	21.0	13.5	18.0	12.5	15.0	9.0

## STREAMS TRIBUTARY TO LAKE HURON

243

## 04128500 INDIAN RIVER AT INDIAN RIVER, MI

LOCATION.--Lat 45°24'38", long 84°37'12", in NE¼ SW¼ sec.24, T.35 N., R.3 W., Cheboygan County, Hydrologic Unit 04070004, on left bank in Indian River, 500 ft (152 m) downstream from Burt Lake, and 2.3 mi (3.7 km) upstream from Mullett Lake.

DRAINAGE AREA.--583 mi<sup>2</sup> (1,510 km<sup>2</sup>).

PERIOD OF RECORD.--April 1942 to current year.

REVISED RECORDS.--WSP 1437: 1942(M), 1945(M), 1947.

GAGE.--Water-stage recorder. Datum of gage is 590.21 ft (179.896 m) National Geodetic Vertical Datum of 1929 (levels by Michigan Department of Natural Resources). Prior to Nov. 12, 1942, nonrecording gage at site 100 ft (30 m) downstream. Auxiliary water-stage recorder 14.3 mi (23.0 km) downstream from base gage, near Cheboygan, datum of gage is 591.21 ft (180.201 m) National Geodetic Vertical Datum of 1929.

REMARKS.--Records good. Flow regulated by dam at Cheboygan. Several observations of water temperature were made during the year.

AVERAGE DISCHARGE.--36 years, 568 ft<sup>3</sup>/s (16.09 m<sup>3</sup>/s), 13.23 in/yr (336 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum daily discharge, 1,220 ft<sup>3</sup>/s (34.6 m<sup>3</sup>/s) May 7, 1972; maximum daily gage height, 5.58 ft (1.701 m) May 13, 14, 1960; minimum daily discharge, 212 ft<sup>3</sup>/s (6.00 m<sup>3</sup>/s) Sept. 2, 1970; minimum daily gage height, 3.34 ft (1.018 m) Oct. 21, 1957.

EXTREMES FOR CURRENT YEAR.--Maximum daily discharge, 842 ft<sup>3</sup>/s (23.8 m<sup>3</sup>/s) May 21; maximum daily gage height, 4.53 ft (1.381 m) May 17, 18, 20; minimum daily discharge, 276 ft<sup>3</sup>/s (7.82 m<sup>3</sup>/s) July 18; minimum daily gage height, 3.53 ft (1.076 m) Mar. 29, 30.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	714	660	618	753	804	652	597	803	694	499	470	487
2	709	647	596	752	790	647	601	785	693	490	442	467
3	686	641	658	755	777	642	587	763	691	495	427	496
4	661	648	675	748	771	644	596	775	686	485	400	484
5	647	636	694	750	764	639	610	776	686	465	371	482
6	652	631	707	743	766	634	617	725	669	433	367	468
7	627	630	706	741	755	634	620	664	677	423	355	482
8	611	636	690	736	752	631	637	624	674	420	330	481
9	615	625	725	781	749	633	643	592	631	396	363	467
10	606	600	709	809	740	632	657	571	593	405	362	468
11	563	657	707	789	735	626	670	539	582	370	380	506
12	642	649	705	775	730	626	704	577	624	356	389	546
13	653	624	709	774	727	625	713	654	627	334	386	537
14	681	611	709	764	716	625	723	675	593	333	403	526
15	733	600	705	749	710	624	734	716	587	325	399	524
16	739	588	703	736	706	622	737	773	571	312	388	539
17	710	586	699	734	698	616	747	807	579	296	428	550
18	712	600	703	726	695	617	758	825	582	276	428	573
19	697	595	701	723	694	616	769	818	578	280	441	571
20	683	577	721	719	684	615	782	841	560	305	433	621
21	682	526	716	715	682	613	787	842	554	305	425	664
22	688	593	713	708	680	613	786	829	545	315	418	674
23	674	595	719	697	669	612	791	818	546	339	425	697
24	671	610	722	689	668	622	790	804	535	341	450	721
25	661	636	730	688	667	616	796	769	533	359	457	745
26	647	627	728	748	663	615	790	750	528	387	470	704
27	653	611	732	820	656	608	786	743	527	422	481	768
28	662	614	736	829	654	607	784	744	514	421	516	749
29	662	602	746	827	---	607	805	732	514	447	509	752
30	662	608	751	815	---	601	809	713	511	453	507	766
31	655	---	744	807	---	605	---	719	---	454	499	---
TOTAL	20658	18463	21877	23400	20102	19319	21426	22766	17884	11941	13119	17515
MEAN	666	615	706	755	718	623	714	734	596	385	423	584
MAX	739	660	751	829	804	652	809	842	694	499	516	768
MIN	563	526	596	688	654	601	587	539	511	276	330	467
CFSM	1.14	1.06	1.21	1.30	1.23	1.07	1.23	1.26	1.02	.66	.73	1.00
IN.	1.32	1.18	1.40	1.49	1.28	1.23	1.37	1.45	1.14	.76	.84	1.12

CAL YR 1977 TOTAL 211387 MEAN 579 MAX 1030 MIN 305 CFSM .99 IN 13.49  
WTR YR 1978 TOTAL 228470 MEAN 626 MAX 842 MIN 276 CFSM 1.07 IN 14.58

## STREAMS TRIBUTARY TO LAKE HURON

04129000 PIGEON RIVER NEAR VANDERBILT, MI

LOCATION.--Lat 45°10'15", long 84°26'18", in SE¼ SW¼ sec.9, T.32 N., R.1 W., Otsego County, Hydrologic Unit 04070004, on right bank at Pigeon River Headquarters, 11.1 mi (17.9 km) east of Vanderbilt, and 26 mi (41.8 km) upstream from Mullett Lake.

DRAINAGE AREA.--63 mi<sup>2</sup> (160 km<sup>2</sup>), approximately.

PERIOD OF RECORD.--September 1950 to current year.

GAGE.--Water-stage recorder. Datum of gage is 886.24 ft (270.126 m) National Geodetic Vertical Datum of 1929.

REMARKS.--Records good except those for the winter period, which are poor. Prior to May 16, 1957, and since Apr. 22, 1958, occasional regulation by Lansing Club Dam, 3.5 mi (5.6 km) above station. Several observations of water temperature were made during the year.

AVERAGE DISCHARGE.--28 years, 78.0 ft<sup>3</sup>/s (2.209 m<sup>3</sup>/s), 16.81 in/yr (427 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,500 ft<sup>3</sup>/s (42.5 m<sup>3</sup>/s) May 15, 1957, gage height, 6.80 ft (2.073 m), from floodmark, from rating curve extended above 500 ft<sup>3</sup>/s (14.2 m<sup>3</sup>/s), result of failure of Lansing Club Dam; minimum, 13 ft<sup>3</sup>/s (0.37 m<sup>3</sup>/s) Jan. 8, 1957.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 350 ft<sup>3</sup>/s (9.91 m<sup>3</sup>/s) Sept. 19, gage height, 4.60 ft (1.402 m); minimum, 19 ft<sup>3</sup>/s (0.54 m<sup>3</sup>/s) Oct. 1, gage height, 1.67 ft (0.509 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	74	56	108	89	74	70	112	81	64	48	52	55
2	69	67	161	91	74	70	107	87	63	48	58	56
3	67	72	110	90	74	68	99	82	60	48	85	56
4	75	87	105	89	74	70	92	81	59	49	63	51
5	66	69	81	92	74	72	108	79	62	49	54	50
6	69	68	92	87	72	74	113	77	60	49	54	49
7	67	75	69	82	72	74	148	78	60	47	50	52
8	99	81	74	81	72	76	156	74	66	46	52	52
9	131	69	82	80	72	76	131	80	59	46	53	53
10	89	78	84	78	70	76	148	95	58	50	52	57
11	84	83	84	78	70	74	250	80	56	46	51	74
12	112	83	86	78	70	81	193	86	66	45	50	81
13	112	72	86	78	70	75	178	154	67	48	49	67
14	84	71	86	76	70	78	157	167	63	47	49	136
15	77	71	88	76	70	79	116	138	59	49	49	145
16	83	78	81	74	70	78	117	101	59	44	48	96
17	69	78	84	74	70	76	134	86	57	47	64	80
18	69	77	109	74	70	82	134	77	60	48	56	144
19	73	102	108	74	70	75	154	79	57	46	55	282
20	67	90	110	74	70	87	170	71	53	48	55	121
21	69	136	113	74	70	75	130	73	55	56	51	109
22	67	95	92	74	70	76	119	64	52	72	51	76
23	65	93	84	74	70	79	122	68	49	78	52	77
24	63	80	84	74	70	78	129	65	51	63	65	67
25	66	86	92	74	70	76	128	67	52	55	62	65
26	66	79	87	74	70	78	142	63	57	54	52	61
27	66	87	81	74	70	74	115	76	51	51	64	67
28	67	81	95	74	70	81	120	70	55	51	78	81
29	73	77	97	74	---	86	108	62	50	59	83	66
30	73	89	93	74	---	85	109	64	50	59	61	71
31	68	---	91	74	---	85	---	63	---	51	52	---
TOTAL	2379	2430	2897	2429	1988	2384	4039	2588	1730	1597	1770	2497
MEAN	76.7	81.0	93.5	78.4	71.0	76.9	135	83.5	57.7	51.5	57.1	83.2
MAX	131	136	161	92	74	87	250	167	67	78	85	282
MIN	63	56	69	74	70	68	92	62	49	44	48	49
CFSM	1.22	1.29	1.48	1.24	1.13	1.22	2.14	1.33	.92	.82	.91	1.32
IN.	1.40	1.43	1.71	1.43	1.17	1.41	2.38	1.53	1.02	.94	1.05	1.47

CAL YR 1977 TOTAL 29745 MEAN 81.5 MAX 262 MIN 52 CFSM 1.29 IN 17.56  
WTR YR 1978 TOTAL 28728 MEAN 78.7 MAX 282 MIN 44 CFSM 1.25 IN 16.96

## STREAMS TRIBUTARY TO LAKE HURON

245

04129500 PIGEON RIVER AT AFTON, MI

LOCATION.--Lat 45°22'26", long 84°30'54", in NW¼ NE¼ sec.2, T.34 N., R.2 W., Cheboygan County, Hydrologic Unit 04070004, on downstream side of bridge on State Highway 68, 0.9 mi (1.4 km) west of Afton, 2.2 mi (3.5 km) downstream from Wilkes Creek, and 7 mi (11 km) upstream from Mullett Lake.

DRAINAGE AREA.--159 mi<sup>2</sup> (412 km<sup>2</sup>).

PERIOD OF RECORD.--April 1942 to current year.

REVISED RECORDS.--WSP 1437: 1945-46, 1950.

GAGE.--Nonrecording gage. Altitude of gage 675 ft (206 m), by barometer. Prior to Oct. 1, 1961, at various sites upstream at present datum.

REMARKS.--Records poor. Prior to May 16, 1957, and since Apr. 22, 1958, occasional regulation by Lansing Club Dam 22 mi (35 km) above station. Several observations of water temperature were made during the year.

AVERAGE DISCHARGE.--36 years, 140 ft<sup>3</sup>/s (3.965 m<sup>3</sup>/s), 11.96 in/yr (304 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,170 ft<sup>3</sup>/s (33.1 m<sup>3</sup>/s) Apr. 17, 1960, gage height, 6.80 ft (2.073 m), from high-water mark; maximum gage height, about 10.5 ft (3.20 m) Mar. 31, 1943, from floodmarks, backwater from ice; minimum discharge, 49 ft<sup>3</sup>/s (1.39 m<sup>3</sup>/s) Aug. 8, 1958.

EXTREMES FOR CURRENT YEAR.--Maximum discharge observed, 536 ft<sup>3</sup>/s (15.2 m<sup>3</sup>/s) Apr. 12, gage height, 5.99 ft (1.826 m); minimum discharge, 62 ft<sup>3</sup>/s (1.76 m<sup>3</sup>/s) Nov. 17, Sept. 5, gage height, 4.30 ft (1.311 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	162	101	165	135	115	115	230	210	145	94	90	41
2	144	107	185	135	115	115	250	195	145	92	105	85
3	144	116	200	135	115	115	230	190	140	92	130	79
4	120	116	144	135	115	115	220	185	135	94	105	81
5	129	95	153	135	115	115	240	180	140	92	91	75
6	131	124	158	130	115	120	250	180	140	90	85	72
7	129	116	158	130	115	120	300	175	135	84	85	75
8	137	112	155	130	115	120	350	175	135	84	85	41
9	191	129	150	125	115	120	320	180	130	84	87	77
10	204	112	150	125	115	120	310	200	125	86	79	85
11	184	103	150	125	115	120	450	200	120	84	77	122
12	181	107	145	125	115	120	520	200	130	80	77	167
13	194	109	145	120	115	125	420	310	130	76	77	153
14	191	105	140	120	115	130	370	370	125	76	81	140
15	165	95	140	120	115	130	320	320	120	76	77	208
16	144	101	140	120	115	135	260	270	120	76	77	211
17	144	91	140	120	115	135	290	220	120	76	83	160
18	144	112	140	120	115	140	310	190	120	76	85	179
19	131	144	145	115	115	145	330	160	115	76	87	249
20	131	151	145	115	115	145	370	165	110	80	87	330
21	124	167	150	115	115	150	320	165	110	92	81	227
22	124	256	150	115	115	150	275	150	105	120	79	169
23	124	216	140	115	115	150	270	155	100	130	79	135
24	114	144	140	115	115	150	280	150	105	115	87	114
25	120	137	140	115	115	156	290	150	105	100	91	97
26	116	144	140	115	115	156	280	145	110	94	91	91
27	116	135	140	115	115	165	270	160	105	94	85	87
28	116	146	140	115	115	155	270	165	105	94	103	112
29	122	156	140	115	---	165	260	150	98	100	116	103
30	122	153	140	115	---	185	250	145	96	96	101	114
31	114	---	140	115	---	205	---	145	---	86	85	---
TOTAL	4412	3900	4608	3780	3220	4287	9105	5955	3619	2789	2748	3969
MEAN	142	130	149	122	115	138	304	192	121	90.0	88.6	132
MAX	204	256	200	135	115	205	520	370	145	130	130	330
MIN	114	91	140	115	115	115	220	145	96	76	77	72
CFSM	.89	.82	.94	.77	.72	.87	1.91	1.21	.76	.57	.56	.83
IN.	1.03	.91	1.08	.88	.75	1.00	2.13	1.39	.85	.65	.64	.93

CAL YR 1977 TOTAL 49916 MEAN 137 MAX 625 MIN 72 CFSM .86 IN 11.68  
WTR YR 1978 TOTAL 52392 MEAN 144 MAX 520 MIN 72 CFSM .91 IN 12.26



## STREAMS TRIBUTARY TO LAKE HURON

04130000 CHEBOYGAN RIVER NEAR CHEBOYGAN, MI

LOCATION.--Lat 45°34'38", long 84°29'15", in SW¼ sec.19, T.37 N., R.1 W., Cheboygan County, Hydrologic Unit 04070004, on right bank 300 ft (91 m) downstream from Millelt Lake, 2.4 mi (3.9 km) upstream from Black River, and 4.8 mi (7.7 km) south of Cheboygan.

DRAINAGE AREA.--865 mi<sup>2</sup> (2,240 km<sup>2</sup>).

PERIOD OF RECORD.--October 1942 to current year. Monthly discharge only for October 1942, published in WSP 1307.

GAGE.--Water-stage recorder. Datum of gage is 591.21 ft (180.201 m) National Geodetic Vertical Datum of 1929. Auxiliary water-stage recorder 5.1 mi (8.2 km) downstream from base gage, in Cheboygan, datum of gage is 590.00 ft (179.832 m) National Geodetic Vertical Datum of 1929. Prior to Aug. 30, 1967, nonrecording auxiliary gage in Cheboygan, 5.2 mi (8.4 km) downstream at present datum.

REMARKS.--Records good except those for the winter period, which are poor. Flow regulated by dam in Cheboygan; prior to Dec. 31, 1965, flow affected by variable backwater from powerplant in Cheboygan 5.2 mi (8.4 km) below station and by Alverno powerplant.

AVERAGE DISCHARGE.--36 years, 818 ft<sup>3</sup>/s (23.17 m<sup>3</sup>/s), 12.84 in/yr (326 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum daily discharge, 1,640 ft<sup>3</sup>/s (46.4 m<sup>3</sup>/s) May 8, 1959; maximum daily gage height, 3.27 ft (0.997 m) May 13, 14, 1960; minimum daily discharge, 90 ft<sup>3</sup>/s (2.55 m<sup>3</sup>/s) Mar. 29, 30, 1958; minimum daily gage height, 1.05 ft (0.320 m) Apr. 13, 14, 15, 1975.

EXTREMES FOR CURRENT YEAR.--Maximum daily discharge, 1,620 ft<sup>3</sup>/s (45.9 m<sup>3</sup>/s) May 17; maximum daily gage height, 2.71 ft (0.826 m) Oct. 11; minimum daily discharge, 370 ft<sup>3</sup>/s (10.5 m<sup>3</sup>/s) July 15, 16; minimum daily gage height, 1.33 ft (0.405 m) Mar. 24, 26, 27, 28, 29.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1080	961	926	1170	971	1050	1020	1190	974	628	655	656
2	1080	791	909	1160	969	1050	1010	1180	996	566	464	643
3	1070	781	1000	1170	970	1060	973	1120	1010	552	426	676
4	1040	774	1050	1160	981	1060	1080	1160	1020	547	407	648
5	938	773	1070	1140	984	1060	1270	1170	1050	491	386	652
6	948	773	1100	1070	991	1070	1230	824	1080	439	402	644
7	956	784	997	1060	1000	1080	1220	529	1070	441	392	647
8	930	820	1030	1060	1050	1080	1290	516	921	451	375	627
9	893	817	1100	1160	1050	1080	1280	498	767	427	487	625
10	936	813	1100	1070	1060	1090	1220	560	780	436	516	621
11	937	838	1090	1080	1070	1080	1170	635	830	414	563	620
12	995	938	1070	1070	1060	1080	1280	787	840	405	581	677
13	1090	918	1080	1060	1060	1070	1250	956	844	388	588	736
14	1160	877	1090	1010	1060	1080	1230	935	820	378	604	647
15	1160	814	1080	1000	1050	1070	1200	1060	797	370	618	515
16	1140	891	1080	1000	1050	1070	1180	1420	788	370	619	613
17	1100	904	1060	1010	1050	1080	1170	1620	782	385	637	752
18	1020	893	986	1020	1060	1070	1150	1560	773	387	635	690
19	919	933	1020	1030	1070	1080	1150	1340	733	374	641	652
20	885	893	1120	1050	1070	1080	1130	1340	652	387	647	769
21	895	870	1110	1050	1070	1090	1120	1370	641	409	613	912
22	924	922	1120	1050	1070	1080	1110	1320	641	393	577	975
23	937	936	1110	1020	1070	1120	1110	1170	650	397	620	1050
24	930	980	1150	975	1070	1200	1110	1100	645	458	747	1060
25	914	1010	1120	976	1080	1100	1120	934	640	562	763	1070
26	911	1050	1120	1070	1070	1090	1120	922	632	593	792	1060
27	946	1010	1130	1070	1060	1080	1130	956	632	614	785	1040
28	987	1020	1150	1000	1060	1070	1130	962	632	631	777	1010
29	998	1020	1150	983	---	1080	1140	963	632	649	693	1010
30	1010	1030	1170	974	---	1060	1170	965	632	666	601	1050
31	1010	---	1160	970	---	1040	---	959	---	673	647	---
TOTAL	30739	26834	33438	32688	29176	33450	34763	32021	23904	14881	18258	23347
MEAN	992	894	1079	1054	1042	1079	1159	1033	797	480	589	778
MAX	1160	1050	1170	1170	1080	1200	1290	1620	1080	673	792	1070
MIN	885	773	909	970	969	1040	973	498	632	370	375	515
CFSM	1.15	1.03	1.25	1.22	1.21	1.25	1.34	1.19	.92	.56	.68	.90
IN.	1.32	1.15	1.44	1.41	1.25	1.44	1.50	1.38	1.03	.64	.79	1.00

CAL YR 1977 TOTAL 308208 MEAN 844 MAX 1610 MIN 363 CFSM .98 IN 13.25  
WTR YR 1978 TOTAL 333499 MEAN 914 MAX 1620 MIN 370 CFSM 1.06 IN 14.34

## STREAMS TRIBUTARY TO LAKE HURON

247

04130500 BLACK RIVER NEAR TOWER, MI

LOCATION.--Lat 45°23'33", long 84°20'00", in SE¼ NE¼ sec.29, T.35 N., R.1 E., Cheboygan County, Hydrologic Unit 04070005, on right bank 400 ft (122 m) downstream from Kleber Dam, 1,000 ft (305 m) upstream from Milligan Creek, 3.0 mi (4.8 km) northwest of Tower, and 10.8 mi (17.4 km) upstream from Black Lake.

DRAINAGE AREA.--313 mi<sup>2</sup> (811 km<sup>2</sup>).

PERIOD OF RECORD.--October 1942 to current year. Monthly discharge only for October 1942, published in WSP 1307.

REVISED RECORDS.--WSP 1307: 1942.

GAGE.--Water-stage recorder. Datum of gage is 658.00 ft (200.558 m) Stanley Engineering Co. datum. Prior to Aug. 1, 1949, at site 1 mi (1.6 km) upstream at different datum.

REMARKS.--Records good. Flow regulated by hydroelectric powerplant 400 ft (122 m) above station. Several observations of water temperature were made during the year.

AVERAGE DISCHARGE.--36 years, 269 ft<sup>3</sup>/s (7.618 m<sup>3</sup>/s), 11.67 in/yr (296 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 2,340 ft<sup>3</sup>/s (66.3 m<sup>3</sup>/s) Apr. 17, 1960, gage height, 7.13 ft (2.173 m); minimum, 0.60 ft<sup>3</sup>/s (0.017 m<sup>3</sup>/s) Mar. 11, 1950; minimum daily, 4.0 ft<sup>3</sup>/s (0.11 m<sup>3</sup>/s) Nov. 27, 1949.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 1,370 ft<sup>3</sup>/s (38.8 m<sup>3</sup>/s) Dec. 9, gage height, 5.44 ft (1.658 m); minimum, 9.8 ft<sup>3</sup>/s (0.28 m<sup>3</sup>/s) Dec. 27, gage height, 1.17 ft (0.357 m); minimum daily, 119 ft<sup>3</sup>/s (3.37 m<sup>3</sup>/s) July 7.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	457	230	409	251	260	248	403	505	250	147	156	176
2	299	230	495	252	259	248	429	501	172	149	159	175
3	257	230	490	252	213	220	414	440	197	149	161	173
4	259	230	516	252	258	180	410	285	191	139	204	168
5	275	233	387	257	183	182	506	296	248	134	213	159
6	267	235	245	260	241	197	414	369	245	127	196	134
7	267	235	248	261	241	196	608	338	173	119	168	149
8	301	254	357	263	180	216	693	390	145	123	169	145
9	381	293	390	263	235	205	702	293	210	124	170	149
10	463	294	164	263	181	250	712	297	245	128	172	148
11	331	238	167	229	235	250	1020	326	175	128	164	220
12	469	236	165	156	261	248	929	319	178	126	149	265
13	395	238	335	199	260	290	999	461	189	124	149	263
14	349	238	218	273	184	250	1030	516	182	124	148	310
15	377	240	351	273	187	250	887	644	182	124	148	344
16	347	240	359	271	228	250	784	622	182	125	150	470
17	257	240	331	201	201	250	738	618	180	124	157	475
18	235	252	426	155	238	251	717	560	180	121	151	391
19	266	282	331	154	258	252	809	284	178	121	154	423
20	293	348	582	153	248	250	877	330	171	121	166	473
21	248	362	521	186	248	253	834	277	182	127	173	593
22	233	332	408	255	242	253	808	262	184	176	159	617
23	233	406	460	253	189	253	746	256	184	279	154	565
24	209	337	352	233	192	310	658	286	182	334	154	389
25	201	276	323	242	210	310	644	256	180	188	149	348
26	233	175	215	235	248	294	581	254	179	164	149	191
27	225	172	199	259	248	253	649	254	152	171	155	237
28	226	284	162	163	248	313	626	255	154	153	189	263
29	227	316	241	164	---	306	557	253	153	122	266	263
30	191	241	278	207	---	325	531	253	149	145	259	243
31	231	---	234	261	---	366	---	253	---	158	174	---
TOTAL	9002	7917	10359	7096	6376	7919	20715	11253	5572	4594	5285	8899
MEAN	290	264	334	229	228	255	691	363	186	148	170	297
MAX	469	406	582	273	261	366	1030	644	250	334	266	617
MIN	191	172	162	153	180	180	403	253	145	119	148	134
CFSM	.93	.84	1.07	.73	.73	.82	2.21	1.16	.59	.47	.54	.45
IN.	1.07	.94	1.23	.84	.76	.94	2.46	1.34	.66	.55	.63	1.06

CAL YR 1977 TOTAL 99857 MEAN 274 MAX 1030 MIN 130 CFSM .88 IN 11.87  
WTR YR 1978 TOTAL 104987 MEAN 288 MAX 1030 MIN 119 CFSM .92 IN 12.48

## STREAMS TRIBUTARY TO LAKE HURON

04131500 RAINY RIVER NEAR OCQUEOC, MI

LOCATION.--Lat 45°24'30", long 84°10'45", in NE¼ NW¼ sec.22, T.35 N., R.2 E., Presque Isle County, Hydrologic Unit 04070005, on upstream side of highway bridge, 4.4 mi (7.1 km) west of Ocqueoc, and 5 mi (8 km) upstream from Black Lake.

DRAINAGE AREA.--85 mi<sup>2</sup> (220 km<sup>2</sup>), approximately.

PERIOD OF RECORD.--October 1952 to current year.

GAGE.--Nonrecording gage. Datum of gage is 674.85 ft (205.694 m) National Geodetic Vertical Datum of 1929.

REMARKS.--Records good except those for the winter period, which are poor. Several observations of water temperature were made during the year.

AVERAGE DISCHARGE.--26 years, 41.6 ft<sup>3</sup>/s (1.178 m<sup>3</sup>/s), 6.65 in/yr (169 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 946 ft<sup>3</sup>/s (26.8 m<sup>3</sup>/s) Apr. 18, 1960, gage height, 6.33 ft (1.929 m), from floodmark; minimum, 0.4 ft<sup>3</sup>/s (0.011 m<sup>3</sup>/s) Sept. 7, 1955.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 418 ft<sup>3</sup>/s (11.8 m<sup>3</sup>/s) Apr. 12, gage height, 4.54 ft (1.384 m); minimum, 2.1 ft<sup>3</sup>/s (0.59 m<sup>3</sup>/s) Aug. 15, gage height, 1.44 ft (0.439 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	85	17	67	50	19	17	62	148	47	4.0	2.3	2.5
2	75	18	88	46	19	17	83	131	41	4.0	2.4	2.3
3	65	20	100	42	19	17	85	116	34	3.9	2.6	2.5
4	55	21	94	36	18	17	85	100	26	3.9	2.7	2.6
5	48	20	85	31	18	17	100	88	23	3.9	2.7	2.3
6	47	20	76	25	18	17	140	83	22	3.8	2.6	2.2
7	39	19	65	23	18	18	173	74	22	3.5	2.5	2.3
8	57	18	72	22	18	23	202	68	25	3.5	2.5	2.3
9	83	18	85	21	18	25	246	71	22	4.0	2.4	2.2
10	83	19	121	21	18	26	272	67	18	13	2.3	2.3
11	87	22	150	21	18	27	366	60	16	10	2.3	3.3
12	79	24	160	20	18	27	410	67	15	7.0	2.3	5.8
13	71	23	120	20	18	26	360	90	15	5.1	2.2	7.0
14	64	22	85	20	18	25	316	122	15	3.4	2.2	16
15	61	21	52	20	18	24	294	134	13	2.7	2.2	16
16	48	23	50	20	18	25	266	118	12	2.5	2.7	9.7
17	42	24	56	19	18	28	270	101	10	2.2	2.7	7.9
18	42	26	70	19	18	26	306	92	8.8	2.2	2.5	17
19	44	26	92	19	18	24	360	82	8.2	2.2	2.5	35
20	42	35	108	19	18	26	384	68	7.9	2.2	2.5	45
21	37	58	112	19	17	24	344	59	7.0	2.3	2.4	39
22	31	59	107	19	17	24	294	51	6.7	3.3	2.3	35
23	26	52	96	19	17	24	274	46	5.6	4.7	2.3	30
24	24	46	85	20	17	29	272	44	5.3	4.2	2.6	26
25	22	52	79	20	17	32	266	37	7.0	3.6	2.6	21
26	21	58	72	20	17	30	246	30	6.1	2.8	2.7	17
27	18	43	67	20	17	28	230	29	5.1	2.7	2.8	23
28	17	35	64	20	17	31	209	26	4.4	2.6	3.2	24
29	17	31	61	20	---	36	192	27	4.2	2.4	3.2	24
30	17	36	58	19	---	44	175	40	4.0	2.3	2.8	34
31	17	---	54	19	---	48	---	53	---	2.3	2.6	---
TOTAL	1464	906	2651	729	499	802	7282	2322	456.3	120.2	78.6	459.2
MEAN	47.2	30.2	85.5	23.5	17.8	25.9	243	74.9	15.2	3.88	2.54	15.3
MAX	87	59	160	50	19	48	410	148	47	13	3.2	45
MIN	17	17	50	19	17	17	62	26	4.0	2.2	2.2	1.2
CFSM	.56	.36	1.01	.28	.21	.31	2.86	.88	.18	.05	.03	.18
IN.	.64	.40	1.16	.32	.22	.35	3.19	1.02	.20	.05	.03	.20

CAL YR 1977 TOTAL 11810.4 MEAN 32.4 MAX 179 MIN 2.2 CFSM .38 IN 5.17  
WTR YR 1978 TOTAL 17769.3 MEAN 48.7 MAX 410 MIN 2.2 CFSM .57 IN 7.78

04132052 CHEBOYGAN RIVER AT CHEBOYGAN, MI  
(National stream-quality accounting network and pesticide station)

LOCATION.--Lat 45°38'02", long 84°28'52", in NW¼ NE¼ sec.6, T.37 N., R.1 W., Cheboygan County, Hydrologic Unit 04070004, at upstream side of bridge on Lincoln Avenue in Cheboygan, 1.75 mi (2.8 km) upstream from mouth.

DRAINAGE AREA.--1,500 mi<sup>2</sup> (3,900 km<sup>2</sup>), approximately.

PERIOD OF RECORD.--October 1974 to current year.

PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE: October 1974 to current year.

WATER TEMPERATURES: October 1974 to current year.

INSTRUMENTATION.--Water-quality monitor since October 1976.

REMARKS.--In addition to water-quality monitor, samples were collected near monitor site by a local observer on an approximate twice-weekly basis. Interruptions in the record were due to malfunctions of the instrument. Flow regulated by dam 1,000 ft (305 m) downstream.

COOPERATION.--Pesticide samples were collected by the U.S. Geological Survey and analyzed by the U.S. Environmental Protection Agency.

EXTREMES FOR PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE (water years 1976-78): Maximum daily, 424 micromhos Jan. 21, 1976; minimum, 262 micromhos Aug. 31, 1977.

WATER TEMPERATURES (water years 1976-78): Maximum, 27.0°C July 20, 1977; minimum, 0.0°C on many days during winter periods.

EXTREMES OUTSIDE PERIOD OF DAILY RECORD.--Specific conductance values of 900 micromhos and 140 micromhos were observed on Apr. 24, 25, 1975 and Mar. 8, 1975, respectively.

EXTREMES FOR CURRENT YEAR.--

SPECIFIC CONDUCTANCE: Maximum, 346 micromhos Mar. 23; minimum, 276 micromhos Aug. 16.

WATER TEMPERATURES: Maximum, 25.5°C Aug. 15; minimum, 0.0°C on many days during winter period.

WATER QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DATE	TIME	STREAM- FLOW, INSTAN- TANEOUS (CFS)	SPE- CIFIC CON- DUCT- ANCE (MICRO- MHOS)	PH (UNITS)	TEMPER- ATURE (DEG C)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION)	COLI- FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML)	STREP- TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML)	HARD- NESS (MG/L AS CAC03)	HARD- NESS, NONCAR- BONATE (MG/L CAC03)
OCT											
13...	1030	2010	300	8.0	5.0	11.0	88	--	36	170	22
NOV											
10...	0930	1150	298	7.7	11.0	10.6	99	58	170	160	4
DEC											
14...	1230	1780	312	7.9	.0	13.1	92	37	25	160	12
JAN											
12...	0915	--	325	7.8	.5	13.3	94	K5	K42	170	14
FEB											
15...	1030	E970	325	8.0	.0	12.7	88	<2	K40	170	14
MAR											
23...	0930	1380	330	7.9	1.0	13.2	94	K8	K10	170	14
APR											
20...	1045	2930	300	7.9	3.0	11.7	96	K9	22	150	12
MAY											
18...	1000	2420	305	8.0	12.0	11.6	109	K5	K10	150	0
JUN											
08...	1000	1050	305	8.2	17.0	9.0	94	19	K11	150	7
JUL											
19...	1015	413	300	8.4	24.0	--	--	45	84	150	7
AUG											
24...	1030	1110	300	8.2	21.0	8.5	94	137	74	150	12
SEP											
21...	0945	2160	305	8.1	15.0	9.7	95	280	240	150	15

DATE	CALCIUM DIS- SOLVED (MG/L AS CA)	MAGNE- SIUM, DIS- SOLVED (MG/L AS MG)	SODIUM, DIS- SOLVED (MG/L AS NA)	SODIUM AD- SORP- TION RATIO	SODIUM PERCENT	POTAS- SIUM, DIS- SOLVED (MG/L AS K)	BICAR- BONATE (MG/L AS HC03)	CAR- BONATE (MG/L AS CO3)	ALKA- LINITY (MG/L AS CAC03)	CARBON DIOXIDE DIS- SOLVED (MG/L AS CO2)	SULFATE DIS- SOLVED (MG/L AS SO4)
OCT											
13...	46	13	3.6	.1	4	1.0	180	0	150	2.9	14
NOV											
10...	42	13	3.8	.1	5	1.0	190	0	160	6.1	14
DEC											
14...	44	13	3.4	.1	4	1.0	180	0	150	3.6	14
JAN											
12...	45	14	3.5	.1	4	.9	190	0	160	4.8	13
FEB											
15...	47	13	3.8	.1	5	.8	190	0	160	3.0	15
MAR											
23...	45	14	3.8	.1	5	1.0	190	0	160	3.8	15
APR											
20...	41	12	3.1	.1	4	1.0	170	0	140	3.4	15
MAY											
18...	39	12	3.4	.1	5	.9	180	0	150	2.9	13
JUN											
08...	42	12	3.5	.1	5	.9	180	0	150	1.8	12
JUL											
19...	40	13	4.0	.1	5	.9	170	4	150	1.1	7.3
AUG											
24...	41	12	3.6	.1	5	.9	170	0	140	1.7	13
SEP											
21...	42	12	3.5	.1	5	.9	170	0	140	2.2	13

E--Estimated  
K--Results based on colony count outside the acceptable range (non-ideal colony count)

STREAMS TRIBUTARY TO LAKE HURON  
04132052 CHEBOYGAN RIVER AT CHEBOYGAN, MI--CONTINUED

WATER-QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978--CONTINUED

DATE	CHLORIDE, DIS- SOLVED (MG/L AS CL)	FLUORIDE, DIS- SOLVED (MG/L AS F)	SILICA, DIS- SOLVED (MG/L AS SiO2)	SOLIDS, RESIDUE AT 180 DEG. C DIS- SOLVED (MG/L)	SOLIDS, SUM OF CONSTITUENTS, DIS- SOLVED (MG/L)	SOLIDS, DIS- SOLVED (TONS PER DAY)	NITRO- GEN, NO2+NO3 TOTAL (MG/L AS N)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N)	NITRO- GEN, ORGANIC TOTAL (MG/L AS N)	NITRO- GEN,AM- MONIA + ORGANIC TOTAL (MG/L AS N)
OCT 13...	4.1	.1	7.9	175	179	950	.03	.01	--	--
NOV 10...	5.2	.1	7.7	194	180	602	.04	.00	--	--
DEC 14...	4.8	.1	7.9	185	177	889	.08	.07	--	--
JAN 12...	4.5	.1	8.1	187	183	--	.07	.01	--	--
FEB 15...	4.3	.1	8.3	190	186	498	.07	.02	.19	.21
MAR 23...	4.1	.2	9.1	194	186	723	.09	.01	.21	.22
APR 20...	5.6	.1	7.2	176	169	1390	.14	.03	.33	.36
MAY 18...	4.4	.0	6.3	175	168	1140	.08	.02	.44	.46
JUN 08...	4.5	.1	6.6	189	170	536	.01	.02	.27	.29
JUL 19...	4.3	.1	7.6	177	165	197	.00	.01	.36	.37
AUG 24...	4.6	.1	7.7	176	167	527	.02	.01	.44	.45
SEP 21...	4.1	.1	7.5	174	167	1010	.06	.01	.50	.51

DATE	NITRO- GEN, NH4 + ORG. SUSP. TOTAL (MG/L AS N)	NITRO- GEN, AM- MONIA + ORGANIC DIS. (MG/L AS N)	NITRO- GEN, TOTAL (MG/L AS N)	NITRO- GEN, TOTAL (MG/L AS NO3)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, DIS- SOLVED (MG/L AS P)	CARBON, ORGANIC TOTAL (MG/L AS C)	SEDI- MENT, SUS- PENDED (MG/L)	SEDI- MENT DIS- CHARGE, SUS- PENDED (T/DAY)	SED. SUSP. SIEVE DIAM. FINER THAN .062 MM
OCT 13...	--	.24	--	--	.18	.00	--	4	22	100
NOV 10...	--	.25	--	--	--	.04	11	3	9.3	100
DEC 14...	--	.28	--	--	.01	.00	13	1	4.8	100
JAN 12...	--	.19	--	--	.01	.02	--	--	--	--
FEB 15...	.02	.19	.28	1.2	.02	.02	5.1	3	7.9	100
MAR 23...	.08	.14	.31	1.4	.00	.00	3.5	2	7.5	100
APR 20...	.06	.30	.50	2.2	.00	.01	--	1	7.9	100
MAY 18...	.33	.13	.54	2.4	.01	.00	8.5	2	13	100
JUN 08...	.04	.25	.30	1.3	.01	.00	6.3	2	5.7	100
JUL 19...	.00	--	.37	1.6	.03	.03	--	1	1.1	100
AUG 24...	.00	.50	.47	2.1	.01	.01	4.1	5	15	100
SEP 21...	.22	.29	.57	2.5	.01	.00	7.0	1	5.8	100



## STREAMS TRIBUTARY TO LAKE HURON

251

04132052 CHEBOYGAN RIVER AT CHEBOYGAN, MI--CONTINUED

WATER-QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978--CONTINUED

DATE	TIME	ARSENIC TOTAL (UG/L AS AS)	ARSENIC DIS- SOLVED (UG/L AS AS)	BARIUM, TOTAL RECOV- ERABLE (UG/L AS BA)	BARIUM, DIS- SOLVED (UG/L AS BA)	CADMIUM TOTAL RECOV- ERABLE (UG/L AS CD)	CADMIUM DIS- SOLVED (UG/L AS CD)	CHRO- MIUM, TOTAL RECOV- ERABLE (UG/L AS CR)	CHRO- MIUM, DIS- SOLVED (UG/L AS CR)	COBALT, TOTAL RECOV- ERABLE (UG/L AS CO)
OCT 13...	1030	2	1	100	100	0	0	<10	1	0
JAN 12...	0915	2	0	0	0	--	1	20	0	0
APR 20...	1045	2	1	0	0	0	0	10	1	2
JUL 19...	1015	0	0	0	0	0	0	10	2	0

DATE	COBALT, DIS- SOLVED (UG/L AS CO)	COPPER, TOTAL RECOV- ERABLE (UG/L AS CU)	COPPER, DIS- SOLVED (UG/L AS CU)	IRON, TOTAL RECOV- ERABLE (UG/L AS FE)	IRON, DIS- SOLVED (UG/L AS FE)	LEAD, TOTAL RECOV- ERABLE (UG/L AS PB)	LEAD, DIS- SOLVED (UG/L AS PB)	MANGA- NESE, TOTAL RECOV- ERABLE (UG/L AS MN)	MANGA- NESE, DIS- SOLVED (UG/L AS MN)	MERCURY TOTAL RECOV- ERABLE (UG/L AS HG)
OCT 13...	0	6	4	90	60	7	5	10	0	<.5
JAN 12...	0	4	2	130	20	--	18	0	0	<.5
APR 20...	0	5	3	100	30	--	2	10	0	<.5
JUL 19...	0	10	6	60	30	3	1	10	10	.5

DATE	MERCURY DIS- SOLVED (UG/L AS HG)	SELE- NIUM, TOTAL (UG/L AS SE)	SELE- NIUM, DIS- SOLVED (UG/L AS SE)	SILVER, TOTAL RECOV- ERABLE (UG/L AS AG)	SILVER, DIS- SOLVED (UG/L AS AG)	ZINC, TOTAL RECOV- ERABLE (UG/L AS ZN)	ZINC, DIS- SOLVED (UG/L AS ZN)	CARBON, ORGANIC DIS- SOLVED (MG/L AS C)	CARBON, ORGANIC SUS- PENDED TOTAL (MG/L AS C)
OCT 13...	<.5	0	0	0	0	10	10	--	.9
JAN 12...	<.5	0	0	0	0	10	10	--	.2
APR 20...	<.5	0	0	0	0	10	10	4.3	.5
JUL 19...	.5	0	0	0	0	10	10	7.6	.3

QUALITATIVE AND ASSOCIATED QUANTITATIVE ANALYSES OF BIOLOGICAL DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
PERI-PHYTON

DATE	TIME	LENGTH OF EXPO- SURE (DAYS)	PERI- PHYTON BIOMASS ASH WEIGHT G/SQ M	PERI- PHYTON BIOMASS TOTAL DRY WEIGHT G/SQ M	CHLOR-A PERI- PHYTON CHROMO- GRAPHIC FLUOROM (MG/M <sup>2</sup> )	CHLOR-B PERI- PHYTON CHROMO- GRAPHIC FLUOROM (MG/M <sup>2</sup> )
NOV 10...	0930	28	.472	.630	.820	.700
FEB 15...	1030	34	.000	.236	.320	.040
MAY 18...	1000	28	8.66	10.6	5.17	.420

STREAMS TRIBUTARY TO LAKE HURON  
04132052 CHEROYGAN RIVER AT CHEROYGAN, MI--CONTINUED

WATER-QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978--CONTINUED

DATE	TIME	PCB, TOTAL (UG/L)	ALDRIN, TOTAL (UG/L)	ALDRIN, TOTAL IN ROT- TOM MA- TERIAL (UG/KG)	ATRA- ZINE, TOTAL (UG/L)	ATRA- ZINE, TOTAL IN ROT- TOM MA- TERIAL (UG/KG)	CHLOR- DANE, TOTAL (UG/L)	CHLOR- DANE, TOTAL IN ROT- TOM MA- TERIAL (UG/KG)	DDD, TOTAL (UG/L)	DDD, TOTAL IN ROT- TOM MA- TERIAL (UG/KG)	DDE, TOTAL (UG/L)	DDE, TOTAL IN ROT- TOM MA- TERIAL (UG/KG)
NOV 10...	0930	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
FEB 15...	1030	ND	ND	--	ND	--	ND	--	ND	--	ND	--
MAY 18...	1000	ND	ND	ND	ND	--	ND	ND	ND	ND	ND	ND
AUG 24...	1030	ND	ND	--	--	--	ND	--	ND	--	ND	--

DATE	DDT, TOTAL (UG/L)	DDT, TOTAL IN ROT- TOM MA- TERIAL (UG/KG)	DT- AZINON, TOTAL (UG/L)	DI- AZINON, TOTAL IN ROT- TOM MA- TERIAL (UG/KG)	DI- ELDRIN TOTAL (UG/L)	DI- FLORIN, TOTAL IN ROT- TOM MA- TERIAL (UG/KG)	ENDRIN, TOTAL (UG/L)	ENDRIN, TOTAL IN ROT- TOM MA- TERIAL (UG/KG)	ETHION, TOTAL (UG/L)	ETHION, TOTAL IN ROT- TOM MA- TERIAL (UG/KG)	HEPTA- CHLOR, TOTAL (UG/L)	HEPTA- CHLOR, TOTAL IN ROT- TOM MA- TERIAL (UG/KG)
NOV 10...	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
FEB 15...	ND	--	ND	--	ND	--	ND	--	ND	--	ND	--
MAY 18...	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
AUG 24...	ND	--	ND	--	ND	--	ND	--	ND	--	ND	--

DATE	HEPTA- CHLOR EPOXIDE TOTAL (UG/L)	HEPTA- CHLOR EPOXIDE TOT. IN BOTTOM MATL. (UG/KG)	LINDANE TOTAL (UG/L)	LINDANE TOTAL IN ROT- TOM MA- TERIAL (UG/KG)	MALA- THION, TOTAL (UG/L)	MALA- THION, TOTAL IN ROT- TOM MA- TERIAL (UG/KG)	METH- OXY- CHLOR, TOTAL (UG/L)	METH- OXY- CHLOR, TOT. IN BOTTOM MATL. (UG/KG)	METHYL PARA- THION, TOTAL (UG/L)	METHYL PARA- THION, TOT. IN BOTTOM MATL. (UG/KG)	METHYL TRI- THION, TOTAL (UG/L)	METHYL TRI- THION, TOT. IN BOTTOM MATL. (UG/KG)
NOV 10...	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
FEB 15...	ND	--	ND	--	ND	--	ND	--	ND	--	ND	--
MAY 18...	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
AUG 24...	ND	--	ND	--	ND	--	ND	--	ND	--	ND	--

DATE	PARA- THION, TOTAL (UG/L)	PARA- THION, TOTAL IN ROT- TOM MA- TERIAL (UG/KG)	SIMA- ZINE TOTAL COUL- SON COND. (UG/L)	SIMA- ZINE IN BOTTOM MATERI- AL (UG/ KG DRY SOLIDS)	TOX- APHENE, TOTAL (UG/L)	TOXA- PHENE, TOTAL (UG/KG)	TRI- THION, TOTAL (UG/L)	TRI- THION, TOTAL IN ROT- TOM MA- TERIAL (UG/KG)	2,4-D, TOTAL (UG/L)	2,4,5-T TOTAL (UG/L)	SILVEX, TOTAL (UG/L)
NOV 10...	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
FEB 15...	ND	--	ND	--	ND	--	ND	--	--	--	--
MAY 18...	ND	ND	ND	--	ND	ND	ND	ND	--	--	--
AUG 24...	ND	--	--	--	ND	--	ND	--	--	--	--

ND--Not detected

04132052 CHEROYGAN RIVER AT CHEROYGAN, MI--CONTINUED

## SPECIFIC CONDUCTANCE (MICROMHOS/CM AT 25 DEG. C), WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
OCTOBER			NOVEMBER			DECEMBER			JANUARY			
1	297	291	294	303	298	301	302	296	299	312	308	310
2	299	293	296	304	301	303	303	296	299	312	310	311
3	298	294	296	305	298	302	300	292	296	311	308	310
4	300	293	297	305	301	303	297	291	295	310	306	309
5	300	297	299	308	301	305	298	295	296	309	307	308
6	300	298	299	306	304	305	299	296	298	310	308	309
7	300	296	299	306	302	305	305	300	303	308	306	307
8	298	291	295	307	302	305	306	302	304	311	302	306
9	299	297	298	310	302	307	303	301	302	312	307	310
10	301	294	298	312	305	309	304	299	302	312	309	311
11	299	296	298	312	306	309	303	300	302	312	308	310
12	296	294	294	311	309	310	304	302	303	316	312	313
13	298	290	294	309	306	308	302	297	300	321	319	320
14	296	290	293	309	305	307	306	296	301	329	325	328
15	295	293	294	307	303	306	306	298	301	333	329	332
16	297	293	295	310	305	308	304	295	300	337	331	335
17	298	291	295	308	305	307	303	296	300	342	328	339
18	296	292	294	307	304	305	305	298	302	342	340	341
19	296	292	294	304	301	303	307	299	302	343	340	342
20	298	291	295	305	295	302	303	296	299	344	342	343
21	296	293	295	310	297	306	306	299	303	345	339	342
22	298	294	297	307	305	306	306	302	304	345	340	342
23	299	293	297	307	300	303	307	302	305	342	341	342
24	299	292	296	305	302	303	310	304	306	341	339	340
25	297	293	295	307	304	306	310	298	305	341	339	340
26	299	293	296	306	302	304	310	309	310	342	340	341
27	301	297	299	305	303	304	312	308	310	342	337	340
28	301	294	298	303	300	302	313	308	311	341	339	339
29	300	296	299	304	301	303	314	308	310	345	340	342
30	300	295	298	304	301	303	312	309	311	345	340	341
31	302	295	299	---	---	---	313	310	311	344	341	342
MONTH	302	290	296	312	295	305	314	291	303	345	302	327

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
FEBRUARY			MARCH			APRIL			MAY			
1	344	340	342	344	340	342	341	338	340	306	297	303
2	344	339	342	343	332	340	341	335	338	314	306	310
3	344	338	341	344	340	342	337	336	337	318	313	316
4	345	331	340	344	339	342	336	334	335	319	316	318
5	345	342	344	345	335	342	334	327	330	321	314	318
6	344	340	342	344	340	342	327	324	325	319	313	316
7	344	340	342	344	339	341	325	315	320	319	312	316
8	344	338	342	344	338	342	314	309	311	317	314	315
9	344	339	342	345	340	342	313	309	311	317	315	316
10	344	341	342	343	339	341	310	305	307	318	313	316
11	344	340	342	342	339	341	303	298	300	317	312	315
12	343	341	342	343	338	341	300	293	297	317	311	315
13	344	340	341	344	340	342	295	292	293	317	313	315
14	345	341	343	342	340	341	299	294	297	314	305	310
15	345	342	343	343	340	342	---	---	---	309	305	307
16	344	342	343	344	341	343	---	---	---	311	307	309
17	345	342	343	345	340	343	---	---	---	313	309	311
18	345	342	343	345	342	344	---	---	---	315	306	312
19	345	342	343	342	339	340	---	---	---	316	312	314
20	345	341	343	344	340	343	---	---	---	318	311	314
21	345	341	343	343	341	342	288	281	284	317	311	315
22	344	340	343	343	340	342	288	283	286	314	311	313
23	345	341	344	346	340	343	296	289	294	316	309	312
24	344	341	343	345	338	342	299	296	298	314	303	311
25	344	340	342	345	336	342	298	282	289	315	307	311
26	343	337	340	344	336	342	283	278	280	312	307	310
27	343	342	343	343	339	341	283	280	281	317	308	312
28	344	340	343	342	334	340	287	278	283	319	307	312
29	---	---	---	342	337	340	286	278	282	321	300	308
30	---	---	---	343	340	341	299	287	292	315	295	301
31	---	---	---	342	339	341	---	---	---	308	300	303
MONTH	345	331	342	346	332	342				321	295	312

STREAMS TRIBUTARY TO LAKE HURON  
04132052 CHEROYGAN RIVER AT CHEROYGAN, MI--CONTINUED

SPECIFIC CONDUCTANCE (MICROMHOS/CM AT 25 DEG. C), WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
	JUNE			JULY			AUGUST			SEPTEMBER		
1	316	308	312	308	295	303	301	293	297	---	---	---
2	316	310	312	307	296	303	300	285	294	---	---	---
3	316	307	312	308	295	303	298	290	294	---	---	---
4	314	308	311	---	---	---	299	291	295	---	---	---
5	---	---	---	---	---	---	297	288	293	---	---	---
6	---	---	---	308	297	303	293	284	290	300	290	297
7	---	---	---	309	299	304	293	283	288	301	297	299
8	---	---	---	309	298	304	289	282	286	302	292	299
9	---	---	---	310	303	307	291	284	287	304	293	300
10	---	---	---	309	300	306	293	286	290	303	291	299
11	---	---	---	314	302	307	293	285	290	301	291	298
12	---	---	---	308	300	304	293	284	288	304	298	301
13	---	---	---	305	300	303	294	282	289	302	292	299
14	---	---	---	305	296	302	295	283	289	301	288	295
15	---	---	---	305	296	301	293	282	288	302	295	298
16	---	---	---	306	296	302	290	276	285	304	295	300
17	---	---	---	305	296	301	291	282	287	304	295	301
18	---	---	---	303	297	300	293	282	288	307	295	302
19	---	---	---	303	296	301	291	282	286	305	294	301
20	---	---	---	307	299	303	292	286	289	304	280	295
21	---	---	---	310	298	304	293	283	288	---	---	---
22	---	---	---	306	302	304	294	284	288	---	---	---
23	---	---	---	305	297	300	291	280	286	---	---	---
24	---	---	---	306	297	301	290	283	287	---	---	---
25	---	---	---	303	296	300	291	283	287	---	---	---
26	310	302	306	304	293	301	294	285	290	---	---	---
27	314	300	307	306	296	303	---	---	---	---	---	---
28	311	301	305	306	300	304	---	---	---	---	---	---
29	309	296	303	304	297	301	---	---	---	---	---	---
30	309	298	304	304	295	300	---	---	---	---	---	---
31	---	---	---	301	292	297	---	---	---	---	---	---

TEMPERATURE (DEG. C) OF WATER, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
	OCTOBER			NOVEMBER			DECEMBER			JANUARY		
1	15.0	14.0	14.5	11.5	10.0	10.5	1.0	1.0	1.0	.0	.0	.0
2	14.5	13.0	13.5	11.5	11.0	11.0	1.0	.0	.5	.0	.0	.0
3	13.5	12.5	13.0	12.0	11.0	11.5	.5	.0	.5	.0	.0	.0
4	15.0	12.5	13.5	12.0	10.5	11.0	.5	.0	.5	.0	.0	.0
5	14.0	12.5	13.0	12.0	10.0	10.5	.5	.0	.5	.0	.0	.0
6	12.5	11.5	12.0	10.5	10.5	10.5	.0	.0	.0	.0	.0	.0
7	12.0	11.5	11.5	10.5	10.5	10.5	.0	.0	.0	.0	.0	.0
8	12.0	10.5	11.5	11.0	10.5	10.5	.0	.0	.0	.0	.0	.0
9	10.5	10.0	10.0	11.5	10.5	11.0	.0	.0	.0	.0	.0	.0
10	11.0	9.5	10.0	11.0	10.0	10.5	.0	.0	.0	.0	.0	.0
11	10.0	9.5	10.0	10.0	8.0	9.0	.0	.0	.0	.0	.0	.0
12	10.5	9.5	9.5	8.0	6.5	7.0	.0	.0	.0	.0	.0	.0
13	11.0	9.5	10.0	7.0	6.0	6.5	.0	.0	.0	.0	.0	.0
14	12.0	10.0	11.0	6.5	6.0	6.0	.0	.0	.0	.0	.0	.0
15	11.0	10.5	10.5	6.0	5.5	5.5	.0	.0	.0	.0	.0	.0
16	10.5	9.0	10.0	6.0	5.0	5.5	.0	.0	.0	.0	.0	.0
17	10.5	9.0	9.5	5.5	5.0	5.0	.5	.5	.5	.0	.0	.0
18	10.5	9.5	10.0	5.0	4.5	5.0	.5	.0	.5	.0	.0	.0
19	11.0	9.0	9.5	5.5	4.5	5.0	.5	.0	.5	.0	.0	.0
20	11.5	9.0	10.0	6.0	4.5	5.0	.5	.5	.5	.0	.0	.0
21	11.0	10.0	10.5	5.5	3.0	4.0	.5	.0	.5	.0	.0	.0
22	10.5	9.5	10.0	3.0	2.0	2.5	.5	.0	.0	.0	.0	.0
23	11.5	9.0	10.0	3.0	2.5	3.0	.0	.0	.0	.0	.0	.0
24	11.0	9.0	10.0	3.0	2.5	3.0	.0	.0	.0	.0	.0	.0
25	12.0	10.0	10.5	2.5	1.0	1.5	.0	.0	.0	.0	.0	.0
26	12.0	10.5	11.0	1.0	.5	1.0	.0	.0	.0	.0	.0	.0
27	11.0	10.5	10.5	1.5	.5	1.0	.0	.0	.0	.0	.0	.0
28	12.0	10.0	10.5	1.5	1.0	1.0	.0	.0	.0	.0	.0	.0
29	11.0	10.5	10.5	1.5	1.0	1.0	.0	.0	.0	.0	.0	.0
30	11.5	10.0	10.5	1.5	1.0	1.0	.0	.0	.0	.0	.0	.0
31	11.5	10.0	10.5	---	---	---	.0	.0	.0	.0	.0	.0
MONTH	15.0	9.0	11.0	12.0	.5	6.0	1.0	.0	.0	.0	.0	.0

STREAMS TRIBUTARY TO LAKE HURON  
04132052 CHEBOYGAN RIVER AT CHEBOYGAN, MI--CONTINUED

255

TEMPERATURE (DEG. C) OF WATER, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
FEBRUARY			MARCH			APRIL			MAY			
1	.0	.0	.0	.0	.0	.0	1.5	.5	1.0	7.0	6.0	6.5
2	.0	.0	.0	.0	.0	.0	2.0	.5	1.0	7.0	6.0	6.5
3	.0	.0	.0	.0	.0	.0	1.5	1.0	1.0	7.5	6.0	7.0
4	.0	.0	.0	.0	.0	.0	1.5	1.0	1.0	8.0	7.0	7.5
5	.0	.0	.0	.0	.0	.0	3.0	1.0	2.0	10.0	8.0	8.5
6	.0	.0	.0	.5	.0	.0	2.0	1.0	1.5	10.5	8.5	9.5
7	.0	.0	.0	.5	.0	.0	2.5	1.5	2.0	11.0	9.0	10.0
8	.0	.0	.0	.5	.0	.0	2.5	1.0	2.0	11.0	10.5	11.0
9	.0	.0	.0	.5	.0	.0	2.5	1.5	2.0	11.0	10.5	11.0
10	.0	.0	.0	.5	.0	.0	2.5	1.5	2.0	12.5	10.5	11.0
11	.0	.0	.0	1.0	.0	.5	2.5	1.5	2.0	13.0	10.5	11.5
12	.0	.0	.0	1.0	.0	.5	2.5	1.5	2.0	12.0	11.0	11.5
13	.0	.0	.0	1.0	.0	.5	2.5	2.0	2.0	11.0	10.5	10.5
14	.0	.0	.0	.5	.0	.5	3.0	2.0	2.5	11.0	10.0	10.5
15	.0	.0	.0	.5	.0	.5	---	---	---	13.0	10.5	11.5
16	.0	.0	.0	.5	.0	.5	---	---	---	13.5	11.5	12.5
17	.0	.0	.0	1.0	.0	.0	---	---	---	14.0	12.0	13.0
18	.0	.0	.0	.5	.0	.0	---	---	---	14.5	12.0	13.0
19	.0	.0	.0	.5	.0	.5	---	---	---	18.0	13.5	15.5
20	.0	.0	.0	.5	.0	.0	---	---	---	17.0	15.5	16.0
21	.0	.0	.0	.5	.0	.5	4.5	3.0	3.5	16.0	14.0	15.0
22	.0	.0	.0	1.0	.0	.5	5.5	3.5	4.5	14.5	13.5	14.0
23	.0	.0	.0	1.0	.0	.5	6.0	4.5	5.5	15.5	13.0	14.0
24	.0	.0	.0	.5	.0	.0	6.5	5.5	6.0	16.0	14.5	15.0
25	.5	.0	.0	1.0	.0	.5	7.5	6.0	7.0	17.0	14.5	15.5
26	.0	.0	.0	1.0	.0	.5	7.5	6.0	7.0	18.5	15.5	17.5
27	.0	.0	.0	1.5	.5	1.0	8.0	6.5	7.5	20.0	17.5	18.5
28	.5	.0	.0	2.0	.5	1.0	8.5	7.5	8.0	21.0	18.5	19.5
29	---	---	---	1.5	.5	1.0	9.0	8.0	8.5	21.5	19.0	20.0
30	---	---	---	1.5	.5	1.0	8.0	7.0	7.5	20.5	19.5	20.0
31	---	---	---	2.0	1.0	1.5	---	---	---	22.0	19.5	20.5
MONTH	.5	.0	.0	2.0	.0	.5				22.0	6.0	13.0

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
JUNE			JULY			AUGUST			SEPTEMBER			
1	21.0	19.5	20.0	24.0	22.5	23.0	22.0	20.5	21.0	---	---	---
2	20.0	18.5	19.5	24.0	22.5	23.0	21.5	20.0	20.5	---	---	---
3	19.5	18.0	18.5	24.0	22.0	23.0	21.5	20.0	21.0	---	---	---
4	18.0	17.5	18.0	---	---	---	21.5	19.5	20.5	---	---	---
5	---	---	---	---	---	---	22.0	19.5	21.0	---	---	---
6	---	---	---	25.0	23.0	24.0	22.5	20.5	21.5	23.0	20.5	21.5
7	---	---	---	24.5	23.5	24.0	23.5	20.5	22.0	21.5	20.5	21.0
8	---	---	---	25.0	23.5	24.0	24.0	21.5	22.5	21.5	20.0	20.5
9	---	---	---	24.0	22.5	23.0	23.0	21.5	22.5	21.0	19.5	20.0
10	---	---	---	23.0	22.0	22.5	23.0	21.0	22.0	21.0	19.5	20.0
11	---	---	---	23.0	20.5	22.0	23.0	21.0	22.5	21.0	19.5	20.0
12	---	---	---	23.0	20.5	22.0	24.0	22.0	23.0	20.0	18.5	19.0
13	---	---	---	23.5	21.5	22.5	24.5	22.5	23.5	18.5	17.5	18.0
14	---	---	---	24.0	21.5	22.5	25.0	23.0	24.0	18.5	17.0	17.5
15	---	---	---	24.0	22.0	23.0	25.5	23.5	24.5	18.5	17.0	17.5
16	---	---	---	23.5	21.5	22.5	25.0	24.0	24.5	18.5	16.5	17.5
17	---	---	---	24.0	22.0	23.0	24.5	23.0	23.5	18.5	17.0	17.5
18	---	---	---	24.0	23.0	23.5	24.0	22.5	23.0	17.0	16.5	17.0
19	---	---	---	25.0	23.5	24.0	23.5	22.5	23.0	17.5	16.0	16.5
20	---	---	---	24.5	23.0	24.0	23.5	22.0	22.5	17.0	16.0	16.5
21	---	---	---	24.5	22.5	23.5	23.5	21.5	22.5	---	---	---
22	---	---	---	23.5	23.0	23.5	23.0	21.5	22.5	---	---	---
23	---	---	---	24.5	23.0	23.5	22.0	21.5	21.5	---	---	---
24	---	---	---	24.0	22.0	23.0	21.5	21.0	21.5	---	---	---
25	---	---	---	24.0	22.5	23.5	22.0	21.0	21.5	---	---	---
26	23.5	21.5	22.5	24.5	23.0	23.5	22.0	21.0	21.5	---	---	---
27	23.5	20.5	22.0	23.5	22.0	23.0	---	---	---	---	---	---
28	24.5	20.5	22.5	23.0	21.5	22.0	---	---	---	---	---	---
29	24.0	22.0	23.0	22.0	21.0	22.0	---	---	---	---	---	---
30	24.0	22.0	23.0	22.0	20.5	21.0	---	---	---	---	---	---
31	---	---	---	21.5	20.0	21.0	---	---	---	---	---	---



## STREAMS TRIBUTARY TO LAKE HURON

## 04133500 THUNDER BAY RIVER NEAR BOLTON, MI

LOCATION.--Lat 45°07'28", long 83°38'50", in NW¼ SE¼ sec.36, T.32 N., R.6 E., Alpena County, Hydrologic Unit 04070006, on left bank 0.7 mi (1.1 km) upstream from Orchard Hill Bridge, 3.8 mi (6.1 km) upstream from North Branch, 4.7 mi (7.6 km) southwest of Bolton, and 11.0 mi (17.7 km) northwest of Alpena.

DRAINAGE AREA.--588 mi<sup>2</sup> (1,520 km<sup>2</sup>).

PERIOD OF RECORD.--March 1945 to current year.

REVISED RECORDS.--WSP 1437: 1946. WSP 1727: 1947 (M).

GAGE.--Water-stage recorder. Datum of gage is 671.96 ft (204.813 m) National Geodetic Vertical Datum of 1929. Prior to Aug. 12, 1945, nonrecording gage at site 500 ft (152 m) downstream at different datum.

REMARKS.--Records good except those for the winter period and those for period of no gage-height record, Feb. 1 to Mar. 15, which are poor. Regulation by Fletcher Pond on the Upper South Branch Thunder Bay River (usable capacity, 40,170 acre-ft or 49.5 km<sup>3</sup>). Several observations of water temperature were made during the year.

AVERAGE DISCHARGE.--33 years, 466 ft<sup>3</sup>/s (13.20 m<sup>3</sup>/s).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 4,290 ft<sup>3</sup>/s (121 m<sup>3</sup>/s) Mar. 26, 1976, gage height, 10.29 ft (3.136 m); maximum gage height, 10.49 ft (3.197 m) Mar. 25, 1976, backwater from ice; minimum, 92 ft<sup>3</sup>/s (2.61 m<sup>3</sup>/s) Sept. 28, 29, 1955.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 2,090 ft<sup>3</sup>/s (59.2 m<sup>3</sup>/s) Apr. 13, gage height, 7.38 ft (2.249 m); minimum, 163 ft<sup>3</sup>/s (4.62 m<sup>3</sup>/s) June 29, gage height, 2.85 ft (0.869 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	381	450	500	390	360	360	440	465	672	257	252	219
2	375	468	480	400	360	360	500	408	676	248	249	210
3	378	466	460	400	360	360	560	393	552	246	259	204
4	357	464	430	400	360	360	640	363	465	248	293	198
5	342	462	400	400	360	360	720	345	417	247	275	199
6	337	460	370	400	360	360	876	330	393	243	257	201
7	335	461	350	390	360	360	1080	325	363	235	245	202
8	350	467	350	380	360	360	1500	308	369	236	243	195
9	429	473	350	370	360	360	1960	318	393	232	238	197
10	492	482	350	350	360	360	2000	330	387	236	234	200
11	519	489	350	370	360	360	1850	332	358	235	237	209
12	471	483	350	380	360	360	1920	328	333	237	212	216
13	456	478	350	400	360	360	2070	399	316	233	203	254
14	444	467	350	400	360	360	1940	588	308	228	204	256
15	417	460	360	410	360	360	1690	682	297	224	197	286
16	399	459	360	420	360	360	1410	728	295	222	194	365
17	378	467	370	420	360	360	1220	618	298	222	195	345
18	366	468	370	420	360	360	1130	519	301	221	198	329
19	355	471	370	410	360	360	1160	438	306	224	199	399
20	352	481	370	400	360	360	1300	384	303	236	198	516
21	350	546	360	400	360	360	1360	393	287	253	196	519
22	347	518	350	390	360	360	1210	393	281	319	191	515
23	350	518	340	380	360	360	1010	369	272	342	192	490
24	345	508	330	370	360	360	855	352	267	367	205	396
25	335	495	310	370	360	360	729	340	265	312	210	326
26	345	472	300	370	360	360	668	325	293	275	215	288
27	429	480	320	370	360	360	624	310	259	258	215	275
28	438	500	340	370	360	360	573	308	304	250	223	283
29	432	510	360	370	---	360	540	302	256	248	250	309
30	426	520	370	360	---	370	498	322	260	253	258	303
31	423	---	380	360	---	390	---	540	---	261	231	---
TOTAL	12153	14443	11400	12020	10080	11200	34033	12555	10546	7848	6968	8904
MEAN	392	481	368	388	360	361	1134	405	352	253	225	297
MAX	519	546	500	420	360	390	2070	728	676	367	293	519
MIN	335	450	300	350	360	360	440	302	256	221	191	195

CAL YR 1977 TOTAL 134508 MEAN 369 MAX 2110 MIN 189  
WTR YR 1978 TOTAL 152150 MEAN 417 MAX 2070 MIN 191

## STREAMS TRIBUTARY TO LAKE HURON

257

04134000 NORTH BRANCH THUNDER BAY RIVER NEAR BOLTON, MI

LOCATION.--Lat 45°08'30", long 83°36'21", in SE¼ NW¼ sec.29, T.32 N., R.7 E., Alpena County, Hydrologic Unit 04070006, on left bank 1.5 mi (2.4 km) upstream from mouth, 2.5 mi (4.0 km) south of Bolton, and 10.3 mi (16.6 km) northwest of Alpena.

DRAINAGE AREA.--184 mi<sup>2</sup> (477 km<sup>2</sup>).

PERIOD OF RECORD.--March 1945 to current year.

GAGE.--Water-stage recorder. Datum of gage is 675.52 ft (205.898 m) National Geodetic Vertical Datum of 1929. Prior to Aug. 16, 1945, nonrecording gage at site 0.5 mi (0.8 km) upstream at different datum.

REMARKS.--Records good except those for the winter period and those for period of no gage-height record, Dec. 8 to Jan. 16, which are poor. Occasional regulation during low flows by dams above station. Several observations of water temperature were made during the year.

AVERAGE DISCHARGE.--33 years, 117 ft<sup>3</sup>/s (3.313 m<sup>3</sup>/s), 8.64 in/yr (219 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 2,950 ft<sup>3</sup>/s (83.5 m<sup>3</sup>/s) Mar. 28, 1976, gage height, 7.46 ft (2.274 m); maximum gage height, 7.98 ft (2.432 m) Mar. 31, 1950, backwater from ice; minimum discharge, 0.40 ft<sup>3</sup>/s (0.011 m<sup>3</sup>/s) Oct. 14, 1955.

EXTREMES FOR CURRENT YEAR.--Peak discharges above base of 500 ft<sup>3</sup>/s (14.2 m<sup>3</sup>/s) and maximum (\*):

Date	Time	Discharge (ft <sup>3</sup> /s) (m <sup>3</sup> /s)	Gage height (ft) (m)	Date	Time	Discharge (ft <sup>3</sup> /s) (m <sup>3</sup> /s)	Gage height (ft) (m)
Apr. 13	2200	*1530 43.3	*6.07 1.850	Apr. 21	0700	1100 31.2	5.58 1.701

Minimum discharge, 2.4 ft<sup>3</sup>/s (0.068 m<sup>3</sup>/s) Aug. 22, 23, gage height, 2.46 ft (0.750 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	106	36	106	87	66	56	210	266	162	16	9.2	10
2	93	36	140	84	66	56	260	233	183	15	8.9	9.4
3	79	36	183	82	66	56	310	197	160	15	9.4	9.7
4	70	36	220	80	64	56	360	166	127	14	9.0	9.1
5	62	36	240	80	64	56	450	141	104	13	8.9	8.8
6	56	37	250	78	64	56	520	126	88	11	9.6	8.3
7	52	38	190	78	64	56	560	118	78	9.5	9.6	7.9
8	56	40	150	76	64	58	660	101	79	8.5	8.9	8.4
9	66	41	140	76	64	64	760	101	72	8.1	8.7	8.1
10	79	46	130	76	64	70	960	101	65	7.7	8.1	7.4
11	98	48	120	76	64	76	1120	95	56	7.3	6.9	13
12	113	49	120	76	64	80	1280	95	50	7.2	6.6	17
13	116	50	120	76	64	82	1400	111	46	6.6	6.2	24
14	112	51	125	76	62	84	1460	170	41	6.0	5.9	28
15	107	50	130	76	62	86	1380	239	36	5.8	5.4	30
16	101	49	130	76	62	88	1210	305	32	5.7	4.8	31
17	92	48	130	76	62	90	1040	334	29	5.4	4.9	36
18	85	47	125	76	60	90	968	295	28	5.0	4.8	40
19	78	48	125	74	60	90	997	248	27	6.0	3.9	46
20	72	54	120	74	60	90	1050	201	26	6.6	3.3	56
21	67	63	120	72	58	92	1090	160	26	8.1	3.0	76
22	63	72	115	72	58	92	985	132	23	11	2.5	79
23	58	83	115	72	58	94	811	111	20	14	2.7	78
24	55	91	110	70	58	94	665	94	19	20	3.8	75
25	52	87	110	70	58	96	553	81	18	23	4.4	67
26	54	97	105	70	58	100	475	70	17	22	4.1	57
27	49	122	105	70	56	105	418	64	14	19	3.7	52
28	45	90	100	68	56	110	369	59	14	15	7.1	49
29	43	110	96	68	---	120	331	53	16	14	8.1	47
30	41	91	92	68	---	140	299	57	17	12	8.5	50
31	40	---	90	66	---	160	---	140	---	10	10	---
TOTAL	2260	1782	4152	2319	1726	2643	22951	4664	1673	347.5	200.9	1038.1
MEAN	72.9	59.4	134	74.8	61.6	85.3	765	150	55.8	11.2	6.48	34.6
MAX	116	122	250	87	66	160	1460	334	183	23	10	79
MIN	40	36	90	66	56	56	210	53	14	5.0	2.5	7.4
CFSM	.40	.32	.73	.41	.34	.46	4.16	.82	.30	.06	.04	.19
IN.	.46	.36	.84	.47	.35	.53	4.64	.94	.34	.07	.04	.21

CAL YR 1977 TOTAL 27957.6 MEAN 76.6 MAX 993 MIN 1.7 CFSM .42 IN 5.65  
WTR YR 1978 TOTAL 45756.5 MEAN 125 MAX 1460 MIN 2.5 CFSM .68 IN 9.25

## STREAMS TRIBUTARY TO LAKE HURON

04135500 AU SABLE RIVER AT GRAYLING, MI

LOCATION.--Lat 44°39'35", long 84°42'45", in SE¼ SE¼ sec.7, T.26 N., R.3 W., Crawford County, Hydrologic Unit 04070007, on right bank 65 ft (20 m) upstream from bridge on Interstate Highway 75 (Business Loop) in Grayling, 0.7 mi (1.1 km) upstream from East Branch, and 114 mi (183 km) upstream from mouth.

DRAINAGE AREA.--110 mi<sup>2</sup> (285 km<sup>2</sup>).

## WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--October 1942 to current year. Monthly discharge only for some periods, published in WSP 1307. Prior to October 1954, published as Middle Branch Au Sable River at Grayling.

GAGE.--Water-stage recorder above steel-crested dam. Datum of gage is 1,123.49 ft (342.440 m) National Geodetic Vertical Datum of 1929.

REMARKS.--Water-discharge records good except those for the winter period, which are fair. Prior to Dec. 31, 1952, diurnal fluctuation caused by powerplant 2.5 mi (4.0 km) above station.

AVERAGE DISCHARGE.--36 years, 74.9 ft<sup>3</sup>/s (2.121 m<sup>3</sup>/s), 9.25 in/yr (235 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 274 ft<sup>3</sup>/s (7.76 m<sup>3</sup>/s) June 2, 1943, gage height, 3.00 ft (0.914 m); minimum, 28 ft<sup>3</sup>/s (0.79 m<sup>3</sup>/s) Apr. 21, 1946, gage height, 0.80 ft (0.244 m).

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 139 ft<sup>3</sup>/s (3.94 m<sup>3</sup>/s) Apr. 13, gage height, 1.96 ft (0.597 m); minimum, 47 ft<sup>3</sup>/s (1.33 m<sup>3</sup>/s) Aug. 14, 15, 16, gage height, 1.08 ft (0.329 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	75	65	82	67	64	56	71	82	67	54	51	52
2	76	66	94	68	62	54	73	81	66	54	54	51
3	75	68	94	65	59	56	72	77	65	53	58	55
4	71	68	83	65	57	56	71	73	64	52	55	54
5	68	68	78	68	58	55	74	72	65	51	54	53
6	66	66	71	68	58	56	81	72	64	51	51	52
7	65	66	69	68	58	56	94	71	64	51	50	50
8	75	66	66	69	58	56	108	71	69	51	50	51
9	87	66	63	64	59	56	110	73	69	51	52	51
10	88	67	65	59	59	59	106	74	66	52	54	51
11	84	68	66	63	60	62	120	75	62	52	50	51
12	86	69	69	67	61	63	134	79	61	51	49	55
13	94	69	70	66	61	63	139	99	62	50	49	56
14	93	68	72	64	60	64	135	116	61	50	47	72
15	84	67	73	61	59	64	126	116	61	49	47	88
16	78	68	73	60	61	62	117	107	61	48	51	81
17	74	69	73	58	60	59	113	94	63	48	54	73
18	72	71	76	56	58	58	113	83	73	49	54	83
19	71	72	78	56	54	58	115	78	70	50	56	111
20	69	75	80	58	54	59	116	77	65	51	54	114
21	69	81	82	58	58	63	113	78	61	59	53	103
22	68	85	80	58	54	63	107	77	59	58	50	88
23	67	81	76	59	55	62	104	74	57	60	50	77
24	67	77	74	61	57	62	102	72	57	59	50	70
25	66	74	67	62	58	61	102	68	57	57	51	66
26	66	67	58	60	58	61	99	66	57	55	51	64
27	66	71	63	53	59	60	94	67	57	54	51	63
28	65	74	69	57	59	62	89	73	56	52	56	64
29	64	73	71	63	---	64	87	75	55	54	57	64
30	64	69	69	64	---	64	84	71	54	54	57	64
31	64	---	68	65	---	65	---	66	---	53	54	---
TOTAL	2277	2114	2272	1930	1638	1859	3069	2457	1868	1633	1620	2027
MEAN	73.5	70.5	73.3	62.3	58.5	60.0	102	79.3	62.3	52.7	52.3	67.6
MAX	94	85	94	69	64	65	139	116	73	60	58	114
MIN	64	65	58	53	54	54	71	66	54	48	47	50
CFSM	.67	.64	.67	.57	.53	.55	.93	.72	.57	.48	.48	.62
IN.	.77	.71	.77	.65	.55	.63	1.04	.83	.63	.55	.55	.69

CAL YR 1977 TOTAL 26485 MEAN 72.6 MAX 162 MIN 51 CFSM .66 IN 8.96  
WTR YR 1978 TOTAL 24764 MEAN 67.8 MAX 139 MIN 47 CFSM .62 IN 8.37

STREAMS TRIBUTARY TO LAKE HURON  
04135500 AU SABLE RIVER AT GRAYLING, MI--CONTINUED

259

WATER-QUALITY RECORDS

PERIOD OF DAILY RECORD.--

WATER TEMPERATURES: March 1953 to current year.

INSTRUMENTATION.--Temperature recorder since March 1953.

REMARKS.--Interruptions in the record were due to malfunctions of the recorder.

EXTREMES FOR PERIOD OF DAILY RECORD.--

WATER TEMPERATURES: Maximum, 28.0°C July 1, 2, 1963; minimum, 0.0°C on many days during winter periods.

EXTREMES FOR CURRENT YEAR.--

WATER TEMPERATURES: Maximum, 27.0°C July 20, 21; minimum recorded, 0.0°C on many days during winter period.

TEMPERATURE (DEG. C) OF WATER, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DAY	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN
	OCTOBER		NOVEMBER		DECEMBER		JANUARY		FEBRUARY		MARCH	
1	12.5	11.0	9.5	8.5	1.0	1.0	.0	.0	.0	.0	.0	.0
2	11.0	9.0	11.0	9.5	1.0	1.0	.0	.0	.0	.0	.0	.0
3	10.0	9.0	11.0	11.0	1.0	1.0	.0	.0	.0	.0	.0	.0
4	11.5	9.0	11.0	10.5	1.0	1.0	.0	.0	.0	.0	.0	.0
5	11.5	10.0	10.5	7.5	1.0	1.0	.0	.0	.0	.0	.0	.0
6	10.5	9.0	8.5	8.5	1.0	1.0	.0	.0	.0	.0	.0	.0
7	9.0	7.0	9.0	8.5	1.0	1.0	.0	.0	.0	.0	---	---
8	8.0	7.5	9.5	9.0	1.0	1.0	.0	.0	.0	.0	---	---
9	8.0	8.0	10.5	9.5	1.0	1.0	.0	.0	.0	.0	---	---
10	9.0	7.0	10.5	7.5	1.0	1.0	.0	.0	.0	.0	---	---
11	9.0	7.5	7.5	4.0	1.0	1.0	.0	.0	.0	.0	---	---
12	7.5	7.0	4.0	2.0	1.0	1.0	.0	.0	.0	.0	---	---
13	7.5	6.5	2.0	2.0	1.0	1.0	.0	.0	.0	.0	---	---
14	9.0	6.5	2.0	2.0	1.0	1.0	.0	.0	.0	.0	---	---
15	9.0	8.0	2.0	2.0	1.0	1.0	.0	.0	.0	.0	---	---
16	8.0	6.0	3.5	2.5	1.0	1.0	.0	.0	.0	.0	---	---
17	6.5	4.5	3.5	3.5	1.0	1.0	.0	.0	.0	.0	---	---
18	6.5	5.5	---	---	1.0	1.0	.0	.0	.0	.0	---	---
19	8.0	6.5	---	---	1.0	1.0	.0	.0	.0	.0	---	---
20	9.0	7.0	---	---	1.0	1.0	.0	.0	.0	.0	---	---
21	9.5	7.5	---	---	1.0	1.0	.0	.0	.0	.0	---	---
22	9.0	7.5	---	---	1.0	1.0	.0	.0	.0	.0	1.5	1.5
23	8.5	6.5	---	---	1.0	.5	.0	.0	.0	.0	3.5	1.5
24	9.5	7.0	---	---	.5	.5	.0	.0	.0	.0	3.5	1.5
25	11.0	9.0	---	---	.5	.0	.0	.0	.0	.0	3.0	1.5
26	11.5	10.5	---	---	.0	.0	.0	.0	.0	.0	2.0	1.5
27	11.5	10.0	---	---	.0	.0	.0	.0	.0	.0	4.5	1.5
28	9.0	8.5	---	---	.0	.0	.0	.0	.0	.0	6.0	4.0
29	9.0	8.0	---	---	.0	.0	.0	.0	---	---	6.0	3.5
30	9.0	7.5	---	---	.0	.0	.0	.0	---	---	4.0	3.0
31	8.5	7.0	---	---	.0	.0	.0	.0	---	---	4.5	3.5
MONTH	12.5	4.5			1.0	.0	.0	.0	.0	.0		

STREAMS TRIBUTARY TO LAKE HURON  
04135500 AU SABLE RIVER AT GRAYLING, MI--CONTINUED

TEMPERATURE (DEG. C) OF WATER, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DAY	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN
	APRIL		MAY		JUNE		JULY		AUGUST		SEPTEMBER	
1	4.5	3.0	13.0	7.5	20.0	17.5	24.5	21.5	20.0	17.5	17.0	15.5
2	4.5	2.0	11.0	8.0	19.5	17.5	21.5	19.5	20.0	19.0	17.5	17.0
3	3.5	2.5	13.0	9.5	17.5	15.0	22.5	19.5	19.0	17.5	17.5	17.0
4	3.0	2.5	13.0	10.5	16.0	14.0	24.0	20.0	18.5	16.0	17.0	16.0
5	6.5	3.0	11.5	9.5	18.0	13.5	24.5	22.5	19.5	17.0	17.5	16.5
6	6.5	4.0	11.5	10.5	19.5	15.5	26.0	23.5	20.5	18.0	17.5	17.0
7	6.5	4.5	13.5	10.5	20.0	18.0	26.5	25.0	21.0	19.0	17.0	17.0
8	7.5	4.5	13.5	12.0	20.0	17.0	26.0	22.0	21.0	19.0	17.0	16.0
9	7.5	4.5	12.0	10.5	19.5	17.0	22.0	20.0	21.0	20.0	16.0	16.0
10	4.5	4.5	12.5	9.0	19.5	16.0	22.0	20.0	20.5	18.0	18.0	15.5
11	6.0	4.5	14.5	11.0	22.0	17.5	22.0	18.5	20.5	18.0	18.5	18.0
12	6.0	6.0	14.5	13.5	22.0	17.5	23.5	20.5	21.0	19.0	18.5	14.5
13	6.0	6.0	13.5	12.5	17.0	14.0	23.5	21.5	22.5	20.0	14.5	13.0
14	6.0	6.0	12.5	11.5	17.0	14.0	24.0	21.5	23.0	22.0	13.0	12.5
15	6.0	6.0	13.0	11.0	17.5	15.0	25.5	23.5	23.0	22.0	14.0	13.0
16	8.0	5.0	13.5	13.0	17.5	16.5	24.5	21.5	22.5	20.0	15.0	13.5
17	10.0	6.5	16.5	12.5	19.0	17.0	25.5	22.5	20.0	18.5	15.0	13.5
18	9.0	7.0	19.0	14.5	21.0	18.0	25.5	24.0	20.0	19.0	13.5	12.5
19	7.0	6.5	20.5	17.0	22.5	19.0	24.5	24.0	19.5	19.0	13.5	12.0
20	---	---	20.5	18.5	23.0	20.5	27.0	24.5	19.5	16.5	14.5	13.5
21	---	---	19.0	15.0	22.5	21.0	27.0	25.0	19.5	17.5	14.5	14.0
22	---	---	19.0	15.5	21.0	18.0	25.0	22.0	20.0	18.5	14.0	12.0
23	---	---	19.0	15.5	20.5	17.5	25.0	24.0	20.0	20.0	14.0	12.0
24	---	---	20.5	16.0	22.0	19.0	26.0	23.0	20.0	19.0	14.5	12.5
25	12.5	9.0	21.5	17.5	22.5	20.5	26.0	20.0	19.5	18.5	14.5	12.5
26	12.5	9.5	21.5	19.5	24.0	22.0	21.5	20.5	20.5	19.0	13.0	12.0
27	13.5	11.5	23.0	20.0	25.0	23.5	20.5	19.0	20.5	19.0	12.5	12.0
28	14.0	11.0	24.0	20.5	25.0	22.5	19.0	16.0	19.0	19.0	12.0	10.5
29	13.5	12.0	24.0	21.0	25.0	22.0	19.0	17.5	18.5	16.0	11.5	10.5
30	13.5	10.0	23.0	21.5	25.0	22.0	18.5	15.5	18.0	16.5	11.0	11.0
31	---	---	21.5	19.5	---	---	18.5	16.0	18.0	16.0	---	---
MONTH			24.0	7.5	25.0	13.5	27.0	15.5	23.0	16.0	18.5	10.5



## STREAMS TRIBUTARY TO LAKE HURON

261

04135600 EAST BRANCH AU SABLE RIVER AT GRAYLING, MI

LOCATION.--Lat 44°40'08", long 84°42'20", in NW¼ NW¼ sec.8, T.26 N., R.3 W., Crawford County, Hydrologic Unit 04070007, on right bank, at south boundary of Michigan Department of Natural Resources field office in Grayling (revised) and 0.4 mi (0.6 km) upstream from mouth.

DRAINAGE AREA.--76.0 mi<sup>2</sup> (196.8 km<sup>2</sup>).

PERIOD OF RECORD.--April 1958 to current year.

GAGE.--Water-stage recorder. Altitude of gage is 1,110 ft (338 m), from topographic map. Prior to Sept. 30, 1958, nonrecording gage at site 10 ft (3 m) downstream at present datum.

REMARKS.--Records good except those for the winter period, which are poor. Occasional regulation by Michigan Department of Natural Resources ponds above station. Several observations of water temperature were made during the year.

AVERAGE DISCHARGE.--20 years, 44.6 ft<sup>3</sup>/s (1.263 m<sup>3</sup>/s), 7.97 in/yr (202 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 207 ft<sup>3</sup>/s (5.86 m<sup>3</sup>/s) Mar. 28, 1976, gage height, 5.24 ft (1.597 m); minimum, 7.0 ft<sup>3</sup>/s (0.20 m<sup>3</sup>/s) Mar. 27, 1965, result of freezeup; minimum daily, 16 ft<sup>3</sup>/s (0.45 m<sup>3</sup>/s) Aug. 20, 1964.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 87 ft<sup>3</sup>/s (2.46 m<sup>3</sup>/s) Apr. 12, gage height, 3.91 ft (1.192 m); minimum, 19 ft<sup>3</sup>/s (0.54 m<sup>3</sup>/s) Aug. 15, 24, gage height, 2.82 ft (0.860 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	42	39	50	35	34	28	42	54	42	28	27	23
2	42	39	50	34	33	28	41	52	40	28	28	26
3	40	39	43	35	32	28	41	51	39	28	29	32
4	38	40	40	36	31	28	42	50	39	27	26	27
5	38	39	39	37	31	27	45	49	42	26	24	26
6	37	38	37	37	31	27	50	48	42	25	24	25
7	37	38	35	37	31	28	60	47	40	25	23	29
8	47	37	33	36	31	28	65	48	43	30	22	31
9	51	38	36	33	30	29	65	48	40	36	22	28
10	49	38	38	34	29	30	65	48	39	38	21	30
11	48	38	38	35	29	31	79	48	38	28	21	28
12	54	38	37	35	29	33	82	55	37	25	21	31
13	54	37	38	34	29	34	86	63	37	25	21	35
14	50	37	39	33	28	34	84	69	36	24	20	47
15	48	37	40	32	27	33	84	66	37	25	20	54
16	46	38	39	31	27	32	83	60	38	25	23	46
17	45	38	39	31	28	30	82	63	42	26	23	41
18	44	38	42	31	28	30	82	57	46	26	22	56
19	43	38	42	32	27	31	83	51	39	27	22	69
20	42	40	43	32	27	31	83	49	36	26	21	66
21	43	45	43	32	28	33	79	50	34	35	20	58
22	42	43	42	32	28	35	75	48	33	37	20	50
23	41	42	41	32	28	37	72	46	34	37	20	44
24	41	40	40	32	28	35	73	44	34	33	20	41
25	40	37	34	32	28	34	70	43	32	29	20	38
26	40	33	30	31	28	35	66	43	32	27	20	36
27	39	38	38	29	28	34	64	44	31	27	21	37
28	39	38	38	32	28	35	61	43	31	26	26	37
29	39	37	37	33	---	36	58	42	30	35	26	35
30	39	35	37	34	---	35	56	43	29	31	23	37
31	38	---	36	34	---	37	---	44	---	28	21	---
TOTAL	1336	1152	1214	1033	816	986	2018	1566	1112	893	697	1163
MEAN	43.1	38.4	39.2	33.3	29.1	31.8	67.3	50.5	37.1	28.8	22.5	38.8
MAX	54	45	50	37	34	37	86	69	46	38	29	69
MIN	37	33	30	29	27	27	41	42	29	24	20	23
CFSM	.57	.51	.52	.44	.38	.42	.89	.66	.49	.38	.30	.51
IN.	.65	.56	.59	.51	.40	.48	.99	.77	.54	.44	.34	.57

CAL YR 1977 TOTAL 15059 MEAN 41.3 MAX 101 MIN 26 CFSM .54 IN 7.37  
WTR YR 1978 TOTAL 13986 MEAN 38.3 MAX 86 MIN 20 CFSM .50 IN 6.85

## STREAMS TRIBUTARY TO LAKE HURON

04135700 SOUTH BRANCH AU SABLE RIVER NEAR LUZERNE, MI

LOCATION.--Lat 44°36'53", long 84°27'20", in SE $\frac{1}{4}$  SE $\frac{1}{4}$  sec.29, T.26 N., R.1 W., Crawford County, Hydrologic Unit 04070007, on right bank 10 ft (3 m) upstream from Smith Bridge, 400 ft (122 m) downstream from bridge on State Highway 72, 4.6 mi (7.4 km) upstream from mouth, and 9.1 mi (14.6 km) west of Luzerne.

DRAINAGE AREA.--401 mi<sup>2</sup> (1,039 km<sup>2</sup>).

## WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--Occasional low-flow measurements, water years 1951-66. October 1966 to current year.

REVISED RECORDS.--WSP 2111: Drainage area.

GAGE.--Water-stage recorder. Altitude of gage is 1,070 ft (326 m), from topographic map. Apr. 19, 1951, to Nov. 14, 1966, nonrecording gage at same site and datum.

REMARKS.--Water-discharge records good except those for the winter period, which are poor. Occasional regulation by dams above station.

AVERAGE DISCHARGE.--12 years, 225 ft<sup>3</sup>/s (6.372 m<sup>3</sup>/s), 7.62 in/yr (194 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,120 ft<sup>3</sup>/s (31.7 m<sup>3</sup>/s) Mar. 28, 1976, gage height, 7.30 ft (2.225 m); minimum, 99 ft<sup>3</sup>/s (2.80 m<sup>3</sup>/s) July 24, 27, 1977, gage height, 4.11 ft (1.253 m).

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 548 ft<sup>3</sup>/s (15.5 m<sup>3</sup>/s) Apr. 10, gage height, 5.91 ft (1.801 m); maximum gage height, 6.19 ft (1.887 m) Feb. 9, backwater from ice; minimum discharge, 100 ft<sup>3</sup>/s (2.83 m<sup>3</sup>/s) Aug. 15, gage height, 4.15 ft (1.265 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	224	202	240	185	148	140	224	245	182	154	116	140
2	228	202	258	185	148	145	245	233	179	154	126	130
3	226	205	252	185	145	145	254	223	175	152	142	128
4	220	208	240	185	145	140	253	215	173	148	140	126
5	216	205	255	180	145	150	268	207	177	145	135	125
6	212	204	238	175	148	140	312	204	173	142	121	122
7	206	205	230	170	148	140	382	200	172	140	119	120
8	218	202	210	165	148	140	455	198	194	138	114	119
9	228	199	205	160	148	140	514	199	192	138	112	118
10	224	200	200	170	145	144	541	208	182	137	110	119
11	232	201	200	168	145	148	526	205	170	134	107	124
12	250	201	195	168	145	150	502	226	162	131	106	154
13	250	199	196	165	145	153	505	293	158	132	105	146
14	245	197	196	160	142	158	491	345	154	132	103	239
15	242	195	196	160	142	156	461	358	149	131	106	295
16	235	199	198	160	140	157	429	363	151	126	108	272
17	228	200	202	160	140	152	400	349	156	123	110	290
18	228	204	222	158	140	152	377	325	207	121	110	349
19	228	207	235	155	140	161	365	299	217	122	113	397
20	226	212	258	155	140	151	358	281	216	122	111	404
21	224	230	262	155	140	162	349	267	214	130	107	422
22	222	226	260	155	138	159	338	251	203	133	104	412
23	220	226	248	150	135	165	327	243	189	132	102	335
24	218	224	245	150	130	159	324	236	180	125	102	346
25	216	215	228	150	130	174	312	225	175	122	103	331
26	214	182	220	150	130	188	300	218	172	121	103	311
27	212	180	220	150	130	176	290	211	170	123	105	296
28	210	196	205	150	135	181	279	204	166	121	162	282
29	207	204	200	150	---	198	267	196	162	124	167	275
30	205	204	205	150	---	203	257	189	157	123	169	282
31	203	---	190	150	---	201	---	185	---	119	163	---
TOTAL	6917	6134	6909	5029	3955	4928	10905	7601	5327	4095	3701	7279
MEAN	223	204	223	162	141	159	364	245	178	132	119	243
MAX	250	230	262	185	148	203	541	363	217	154	169	422
MIN	203	180	190	150	130	140	224	185	149	119	102	118
CFSM	.56	.51	.56	.40	.35	.40	.91	.61	.44	.33	.30	.61
IN.	.64	.57	.64	.47	.37	.46	1.01	.71	.49	.38	.34	.68

CAL YR 1977 TOTAL 64317 MEAN 176 MAX 452 MIN 100 CFSM .44 IN 5.97  
WTR YR 1978 TOTAL 72780 MEAN 199 MAX 541 MIN 102 CFSM .50 IN 6.75

## STREAMS TRIBUTARY TO LAKE HURON

263

04135700 SOUTH BRANCH AU SABLE RIVER NEAR LUZERNE, MI--CONTINUED

## WATER-QUALITY RECORDS

## PERIOD OF DAILY RECORD.--

WATER TEMPERATURES: November 1966 to current year.

## INSTRUMENTATION.--Temperature recorder since November 1966.

## EXTREMES FOR PERIOD OF DAILY RECORD.--

WATER TEMPERATURES: Maximum, 24.0°C July 16, 1968, July 20, 1977; minimum, 0.0°C on many days during winter periods.

## EXTREMES FOR CURRENT YEAR.--

WATER TEMPERATURES: Maximum, 22.5°C July 6; minimum, 0.5°C on many days during winter period.

## TEMPERATURE (DEG. C) OF WATER, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DAY	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN
	OCTOBER		NOVEMBER		DECEMBER		JANUARY		FEBRUARY		MARCH	
1	12.5	11.0	9.5	8.5	3.0	2.5	1.0	1.0	1.5	1.0	1.5	.5
2	11.0	10.0	10.0	9.5	3.0	2.5	1.0	1.0	1.5	1.0	.5	.5
3	11.0	9.5	10.0	10.0	2.5	2.0	1.0	1.0	1.0	1.0	1.5	.5
4	11.0	9.0	10.5	9.0	2.0	2.0	1.0	1.0	1.0	1.0	.5	.5
5	11.0	10.0	9.0	7.5	2.5	2.0	1.5	1.0	1.0	1.0	1.0	.5
6	11.0	9.0	8.5	8.5	2.5	2.0	1.5	1.5	1.0	1.0	1.0	.5
7	10.0	8.0	9.0	8.5	2.0	2.0	2.0	1.5	1.0	1.0	1.0	.5
8	9.5	9.0	9.5	9.0	2.0	2.0	2.5	1.5	1.0	1.0	1.5	.5
9	9.5	9.0	10.0	9.5	2.0	2.0	1.5	1.0	1.0	1.0	2.5	.5
10	9.0	7.5	10.0	8.0	1.5	1.5	1.0	1.0	1.0	1.0	2.5	1.0
11	9.0	8.5	8.0	6.0	1.5	1.5	1.0	1.0	1.0	1.0	4.5	2.5
12	8.5	8.0	6.0	4.5	1.5	1.5	1.0	1.0	1.0	1.0	4.5	3.0
13	8.5	7.0	4.5	4.0	2.0	1.5	1.0	1.0	1.5	1.0	4.0	2.5
14	8.0	7.0	4.0	4.0	2.5	2.0	1.0	1.0	1.5	1.0	3.5	1.5
15	8.0	8.0	4.0	4.0	3.0	2.5	1.0	1.0	1.5	1.0	2.5	2.0
16	8.0	6.5	5.0	4.0	3.0	3.0	1.0	1.0	1.5	1.5	2.5	2.0
17	6.5	5.0	4.5	4.5	3.0	3.0	1.0	1.0	1.5	1.0	2.5	1.0
18	6.5	6.0	4.5	4.5	3.0	3.0	1.0	1.0	1.5	1.0	2.5	1.0
19	7.5	6.5	4.5	4.5	3.0	3.0	1.0	1.0	1.0	1.0	4.5	1.5
20	8.0	6.5	4.5	4.0	3.0	2.0	1.0	1.0	1.0	1.0	3.5	1.5
21	8.0	7.0	4.5	4.0	2.0	2.0	1.0	1.0	1.0	1.0	3.0	3.0
22	8.0	7.0	4.0	3.0	2.0	2.0	1.0	1.0	1.0	1.0	3.5	2.5
23	7.5	6.0	3.0	2.5	2.0	2.0	1.0	1.0	1.0	1.0	4.5	2.5
24	8.0	6.5	3.0	2.5	2.0	2.0	1.0	1.0	1.5	.5	3.5	1.5
25	8.5	7.5	3.0	2.0	2.0	1.5	1.5	1.0	1.5	1.0	2.5	1.0
26	10.0	8.5	2.0	2.0	1.5	1.5	1.5	.5	1.5	.5	2.5	2.0
27	9.5	8.5	2.0	2.0	1.5	1.5	.5	.5	1.5	1.0	5.0	2.0
28	9.0	8.0	2.5	2.0	1.5	1.5	.5	.5	1.5	1.0	5.5	3.5
29	8.5	8.0	2.5	2.5	1.5	1.5	1.0	.5	---	---	5.0	3.5
30	8.5	7.5	2.5	2.0	1.5	1.0	1.0	1.0	---	---	3.5	2.0
31	8.5	7.0	---	---	1.0	1.0	1.0	1.0	---	---	4.0	3.5
MONTH	12.5	5.0	10.5	2.0	3.0	1.0	2.5	.5	1.5	.5	5.5	.5

## STREAMS TRIBUTARY TO LAKE HURON

04135700 SOUTH BRANCH AU SABLE RIVER NEAR LUZERNE, MI--CONTINUED

## TEMPERATURE (DEG. C) OF WATER, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DAY	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN
	APRIL		MAY		JUNE		JULY		AUGUST		SEPTEMBER	
1	4.0	3.5	11.5	7.5	18.0	15.5	20.0	16.5	18.0	13.0	16.5	12.5
2	3.5	2.0	11.0	7.0	18.0	15.0	17.5	16.0	16.5	14.0	17.0	14.0
3	3.5	2.5	11.5	7.5	15.5	13.0	20.0	15.5	17.0	14.0	17.0	15.0
4	3.0	2.5	10.5	8.5	14.0	12.0	20.0	15.0	17.0	12.5	15.5	13.0
5	5.0	2.5	11.0	9.0	16.0	12.0	20.5	16.5	18.0	13.0	15.5	14.0
6	4.5	3.0	11.0	9.5	17.5	12.5	22.5	18.0	17.0	13.5	15.5	14.5
7	3.5	2.5	13.0	8.5	17.0	14.5	22.0	19.5	18.5	15.0	16.0	14.5
8	3.0	2.0	12.5	11.0	17.0	14.0	20.5	17.5	19.0	14.5	14.5	14.0
9	3.0	1.5	11.0	10.0	17.0	13.5	18.0	15.0	18.5	16.0	14.5	14.0
10	2.0	1.5	12.5	9.0	17.5	13.0	18.5	15.5	17.5	13.5	16.5	13.0
11	3.0	2.0	13.0	10.0	19.5	15.0	18.0	13.5	17.5	13.0	17.0	15.0
12	4.0	3.0	13.0	12.0	19.5	15.0	19.0	14.0	18.5	15.0	17.0	13.5
13	3.0	3.0	12.0	11.0	16.0	12.0	19.0	16.5	19.5	15.5	13.5	12.5
14	4.0	3.5	11.5	11.0	15.5	11.5	20.0	15.0	21.0	16.5	13.0	12.5
15	4.0	4.0	12.5	11.5	15.5	13.0	21.0	17.0	19.5	16.5	13.5	13.0
16	6.0	3.5	12.5	12.0	15.0	14.0	20.0	15.0	19.0	16.5	14.0	12.0
17	7.5	5.5	14.0	11.0	16.0	14.0	20.0	15.0	19.0	15.5	14.0	13.0
18	7.0	6.5	17.0	13.0	18.0	15.0	20.0	17.0	18.0	15.0	13.0	12.5
19	6.5	6.0	18.5	15.0	19.0	15.0	19.0	17.0	17.5	16.0	12.0	13.0
20	6.5	5.5	18.0	16.0	19.0	15.5	21.0	18.0	17.0	13.0	14.5	14.0
21	7.5	5.0	16.5	13.5	18.0	17.0	21.0	18.5	17.5	13.0	14.5	14.5
22	8.5	6.0	17.5	13.0	18.0	14.5	19.5	17.0	17.5	13.5	14.5	13.0
23	8.0	7.0	16.5	13.5	17.5	14.0	20.5	18.0	17.0	15.5	13.5	12.0
24	10.0	7.5	19.0	14.5	18.5	14.0	21.0	16.0	15.5	15.0	14.0	12.0
25	10.5	7.5	19.5	15.0	21.0	16.0	20.0	15.0	17.0	14.5	14.0	12.5
26	11.0	8.0	19.5	16.0	18.5	17.5	18.5	16.5	18.5	15.5	13.5	11.5
27	12.0	8.5	21.0	16.5	21.0	19.0	18.5	15.0	17.5	15.5	13.5	13.0
28	12.5	9.0	21.5	17.5	21.5	18.0	17.5	13.0	16.0	15.5	13.0	12.0
29	12.0	9.5	21.0	17.5	21.0	18.0	17.0	15.0	18.0	15.0	13.0	12.0
30	11.0	8.5	20.5	17.5	21.0	17.5	17.0	12.0	17.5	14.5	13.0	12.5
31	---	---	19.0	16.5	---	---	15.5	12.0	16.5	13.5	---	---
MONTH	12.5	1.5	21.5	7.0	21.5	11.5	22.5	12.0	21.0	12.5	17.0	11.5

## STREAMS TRIBUTARY TO LAKE HURON

265

04136500 AU SABLE RIVER AT MIO, MI

LOCATION.--Lat 44°39'36", long 84°07'52", in NW¼ sec.7, T.26 N., R.3 E., Oscoda County, Hydrologic Unit 04070007, on right bank 150 ft (46 m) upstream from bridge on State Highway 33 in Mio, 500 ft (152 m) downstream from Mio hydroelectric plant, 9.5 mi (15.3 km) downstream from Big Creek, and 73.0 mi (117.5 km) upstream from mouth.

DRAINAGE AREA.--1,100 mi<sup>2</sup> (2,850 km<sup>2</sup>), approximately.

PERIOD OF RECORD.--July 1952 to current year.

GAGE.--Water-stage recorder. Datum of gage is 929.60 ft (283.342 m) National Geodetic Vertical Datum of 1929.

REMARKS.--Records good. Flow regulated at all stages by hydroelectric plant 500 ft (152 m) above station. Several observations of water temperature were made during the year.

AVERAGE DISCHARGE.--26 years, 988 ft<sup>3</sup>/s (27.98 m<sup>3</sup>/s), 12.20 in/yr (310 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 4,170 ft<sup>3</sup>/s (118 m<sup>3</sup>/s) Mar. 28, 1976, gage height, 6.14 ft (1.871 m); minimum, 7.0 ft<sup>3</sup>/s (0.20 m<sup>3</sup>/s) Aug. 4, 1977, gage height, -0.09 ft (-0.027 m); minimum daily, 21 ft<sup>3</sup>/s (0.59 m<sup>3</sup>/s) Aug. 9, 1977.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 2,510 ft<sup>3</sup>/s (71.1 m<sup>3</sup>/s) Apr. 19, gage height, 4.74 ft (1.445 m); minimum, 27 ft<sup>3</sup>/s (0.76 m<sup>3</sup>/s) June 22, gage height, 0.21 ft (0.064 m); minimum daily, 653 ft<sup>3</sup>/s (18.5 m<sup>3</sup>/s) Jan. 10.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	987	922	1150	944	870	788	1050	1040	870	745	715	740
2	1060	915	1250	900	844	769	1150	968	854	763	730	745
3	1050	930	1270	849	813	818	1130	967	843	744	872	745
4	985	940	1120	849	722	811	1100	932	815	752	872	740
5	938	922	994	893	815	721	1100	914	816	748	770	745
6	904	905	989	972	840	778	1330	914	825	724	745	740
7	912	903	933	959	779	828	1620	874	824	710	740	545
8	975	914	807	953	824	827	1860	903	854	708	720	715
9	1120	912	768	861	806	826	1770	974	888	714	720	740
10	1150	895	817	653	819	842	1670	981	853	746	700	740
11	1080	880	727	701	841	861	1820	960	830	738	685	740
12	1110	878	760	856	836	831	1950	985	816	728	705	842
13	1210	892	1040	925	832	819	1990	1480	772	734	715	826
14	1140	911	1130	874	843	853	1540	1620	774	720	670	844
15	1080	919	1090	761	839	849	1690	1550	786	713	665	1440
16	1030	919	1040	791	842	332	1600	1340	785	720	695	1240
17	981	944	954	814	838	827	1590	1310	782	688	730	1110
18	988	990	958	769	824	827	1350	1200	979	671	730	1330
19	991	1020	1060	870	763	832	1680	1080	921	689	790	1640
20	987	1040	1090	851	730	839	1520	1040	889	718	780	1540
21	949	1040	1120	810	788	845	1490	1060	941	797	720	1340
22	934	981	1110	812	774	873	1350	985	792	890	690	1240
23	916	901	1060	825	807	898	1290	944	838	876	685	1240
24	940	833	1020	827	861	897	1360	933	793	817	700	1140
25	934	885	995	869	853	896	1260	924	789	761	700	1070
26	938	964	789	855	838	896	1240	919	781	746	700	1010
27	889	948	694	739	841	890	1090	904	785	767	710	1000
28	914	975	763	752	830	911	1070	900	785	766	890	1040
29	914	1000	878	836	---	950	1120	901	748	750	956	1020
30	904	1120	972	877	---	985	1090	890	723	765	824	1040
31	914	---	944	902	---	990	---	884	---	745	775	---
TOTAL	30824	28198	30292	26149	22912	26409	43270	32276	24751	23157	23099	30377
MEAN	994	940	977	844	818	852	1442	1041	825	747	745	1013
MAX	1210	1120	1270	972	870	990	1990	1620	979	890	956	1640
MIN	889	833	694	653	722	721	1050	874	723	671	665	545
CFSM	.89	.86	.89	.77	.74	.78	1.31	.95	.75	.68	.68	.92
IN.	1.04	.95	1.02	.88	.77	.89	1.46	1.09	.84	.78	.78	1.73

CAL YR 1977 TOTAL 336859 MEAN 923 MAX 2060 MIN 21 CFSM .84 IN 11.39  
WTR YR 1978 TOTAL 341714 MEAN 936 MAX 1990 MIN 653 CFSM .85 IN 11.56



## STREAMS TRIBUTARY TO LAKE HURON

04137500 AU SABLE RIVER NEAR AU SABLE, MI  
(National stream-quality accounting network station)

LOCATION.--Lat 44°26'09", long 83°26'28", in NE¼ NW¼ sec.35, T.24 N., R.8 E., Iosco County, Hydrologic Unit 04070007, 5.5 mi (8.8 km) northwest of Au Sable and 10.4 mi (16.7 km) upstream from mouth.

DRAINAGE AREA.--1,540 mi<sup>2</sup> (3,990 km<sup>2</sup>), approximately.

PERIOD OF RECORD.--April to September 1978.

PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE: April to September 1978.

WATER TEMPERATURES: April to September 1978.

REMARKS.--Daily record based on samples collected at mid-stream of bridge .6 mi (1.0 km) downstream from Foote Dam. Daily samples collected between 0600 and 1000 hours. Monthly samples are collected as a cross-section sample at or near vicinity of bridge. Water-discharge measurements are made at times of monthly sampling.

EXTREMES FOR PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE: Maximum, 310 micromhos June 7, 8; minimum, 250 micromhos May 6, 11, July 30.

WATER TEMPERATURES: Maximum, 24.0°C July 24,26; minimum, 3.0°C Apr. 21,22.

EXTREMES OUTSIDE PERIOD OF DAILY RECORD.--A specific conductance of 325 micromhos was observed Mar. 22, 1978. A water temperature of 0°C was observed Jan. 12, Feb. 14, 1978.

## WATER QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DATE	TIME	STREAM- FLOW- INSTAN- TANEOUS (CFS)	SPE- CIFIC CON- DUCT- ANCE (MICRO- MHOS)	PH (UNITS)	TEMPER- ATURE (DEG C)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION)	COLI- FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML)	STREP- TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML)	HARD- NESS (MG/L AS CAC03)	HARD- NESS, NONCAR- BONATE (MG/L CAC03)
JAN											
12...	1130	E4140	320	7.9	.0	12.0	82	<1	44	160	4
FEB											
14...	1100	E2650	320	7.7	.0	11.4	79	<2	K9	170	22
MAR											
22...	1100	E4140	325	7.7	1.0	14.5	103	<1	<1	150	0
APR											
19...	1200	E4420	295	7.9	6.0	10.9	89	<1	<1	140	2
MAY											
17...	1130	3150	261	8.1	12.5	10.1	95	<1	K17	120	6
JUN											
07...	0730	590	300	8.0	20.0	8.5	93	K9	K7	150	7
JUL											
18...	0945	41	300	8.2	23.0	--	--	K9	58	160	18
AUG											
23...	1130	2380	305	8.2	24.0	8.3	98	K2	K7	150	15
SEP											
20...	1030	502	300	8.1	19.0	9.0	98	K3	50	150	8

E--ESTIMATED VALUE

K--BASED ON COLONY COUNT OUTSIDE THE ACCEPTABLE RANGE (NON-IDEAL COLONY COUNT)

DATE	CALCIUM DIS- SOLVED (MG/L AS CA)	MAGNE- SIUM, DIS- SOLVED (MG/L AS MG)	SODIUM, DIS- SOLVED (MG/L AS NA)	SODIUM AD- SORP- TION RATIO	SODIUM PERCENT	POTAS- SIUM, DIS- SOLVED (MG/L AS K)	BICAR- BONATE (MG/L AS HCO3)	CAR- BONATE (MG/L AS CO3)	ALKA- LINITY (MG/L AS CAC03)	CARBON DIOXIDE DIS- SOLVED (MG/L AS CO2)	SULFATE DIS- SOLVED (MG/L AS SO4)
JAN											
12...	46	11	4.5	.2	6	.7	190	0	160	3.8	12
FEB											
14...	48	11	4.3	.1	5	.6	180	0	150	5.7	13
MAR											
22...	43	11	4.2	.1	6	.7	186	0	150	5.9	13
APR											
19...	40	10	4.0	.1	6	.9	170	0	140	3.4	14
MAY											
17...	35	8.1	3.2	.1	5	.8	140	0	110	1.8	14
JUN											
07...	42	10	3.6	.1	5	.7	170	0	140	2.7	10
JUL											
18...	45	11	4.0	.1	5	.6	170	0	140	1.7	11
AUG											
23...	42	12	4.3	.2	6	.5	170	0	140	1.7	9.8
SEP											
20...	41	11	4.2	.2	6	.5	170	0	140	2.2	10

STREAMS TRIBUTARY TO LAKE HURON  
04137500 AU SABLE RIVER NEAR AU SABLE, MI--CONTINUED

267

WATER-QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978--CONTINUED

DATE	CHLORIDE, DIS-SOLVED (MG/L AS CL)	FLUORIDE, DIS-SOLVED (MG/L AS F)	SILICA, DIS-SOLVED (MG/L AS SI02)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L)	SOLIDS, SUM OF CONSTITUENTS, DIS-SOLVED (MG/L)	SOLIDS, DIS-SOLVED (TONS PER DAY)	NITRO- GEN, NO2+NO3 TOTAL (MG/L AS N)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N)	NITRO- GEN, ORGANIC TOTAL (MG/L AS N)	NITRO- GEN,AM- MONIA + ORGANIC TOTAL (MG/L AS N)
JAN 12...	5.5	.1	8.4	180	182	E2010	.12	.01	--	--
FEB 14...	4.5	.1	9.1	176	179	E1260	.12	.01	--	--
MAR 22...	4.4	.1	10	180	178	E2010	.13	.02	.18	.20
APR 19...	5.3	.1	7.6	166	166	E1980	.16	.07	.20	.27
MAY 17...	4.1	.0	6.5	151	141	1280	.04	.03	.35	.38
JUN 07...	4.8	.1	6.9	167	162	266	.00	.01	.28	.29
JUL 18...	4.3	.1	8.8	171	169	18.9	.00	.01	.21	.22
AUG 23...	4.7	.1	9.3	172	166	1110	.00	.00	.62	.62
SEP 20...	4.8	.1	9.0	166	164	225	.01	.01	.40	.41

DATE	NITRO- GEN,NH4 + ORG. SUSP. TOTAL (MG/L AS N)	NITRO- GEN,AM- MONIA + ORGANIC DIS- (MG/L AS N)	NITRO- GEN, TOTAL (MG/L AS N)	NITRO- GEN, TOTAL (MG/L AS NO3)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, DIS- SOLVED (MG/L AS P)	CARBON, ORGANIC TOTAL (MG/L AS C)	SEDI- MENT, SUS- PENDE (MG/L)	SEDI- MENT DIS- CHARGE, SUS- PENDE (T/DAY)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM
JAN 12...	--	.17	--	--	.00	.00	--	4	E45	100
FEB 14...	.00	.16	--	--	.01	.00	1.9	2	E14	100
MAR 22...	.03	.17	.33	1.5	.00	.00	6.7	6	E67	100
APR 19...	.00	.28	.43	1.9	.00	.00	--	5	F60	100
MAY 17...	.34	.04	.42	1.9	.01	.00	8.7	8	68	100
JUN 07...	.13	.16	.29	1.3	.01	.00	7.9	1	1.6	100
JUL 18...	.00	.26	.22	.97	.00	.00	--	3	.33	100
AUG 23...	.16	.46	.62	2.7	.04	.04	13	6	39	100
SEP 20...	.11	.30	.42	1.9	.01	.00	5.8	0	.00	100

E--ESTIMATED VALUE

STREAMS TRIBUTARY TO LAKE HURON  
04137500 AU SABLE RIVER NEAR AU SABLE, MI--CONTINUED

## WATER-QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978--CONTINUED

DATE	TIME	ARSENIC TOTAL (UG/L AS AS)	ARSENIC DIS- SOLVED (UG/L AS AS)	BARIUM, TOTAL RECOV- ERABLE (UG/L AS BA)	BARIUM, DIS- SOLVED (UG/L AS BA)	CADMIUM TOTAL RECOV- ERABLE (UG/L AS CD)	CADMIUM DIS- SOLVED (UG/L AS CD)	CHRO- MIUM, TOTAL RECOV- ERABLE (UG/L AS CR)	CHRO- MIUM, DIS- SOLVED (UG/L AS CR)	COBALT, TOTAL RECOV- ERABLE (UG/L AS CO)
JAN 12...	1130	0	0	0	0	1	0	10	0	0
APR 19...	1200	2	1	0	0	--	1	<10	0	0
JUL 18...	0945	2	1	0	0	0	0	10	2	2

DATE	COBALT, DIS- SOLVED (UG/L AS CO)	COPPER, TOTAL RECOV- ERABLE (UG/L AS CU)	COPPER, DIS- SOLVED (UG/L AS CU)	IRON, TOTAL RECOV- ERABLE (UG/L AS FE)	IRON, DIS- SOLVED (UG/L AS FE)	LEAD, TOTAL RECOV- ERABLE (UG/L AS PB)	LEAD, DIS- SOLVED (UG/L AS PB)	MANGA- NESE, TOTAL RECOV- ERABLE (UG/L AS MN)	MANGA- NESE, DIS- SOLVED (UG/L AS MN)	MERCURY TOTAL RECOV- ERABLE (UG/L AS HG)
JAN 12...	0	3	1	140	10	--	2	20	20	<.5
APR 19...	0	8	6	160	20	0	0	20	10	<.5
JUL 18...	0	3	1	80	30	4	3	10	10	.5

DATE	MERCURY DIS- SOLVED (UG/L AS HG)	SELE- NIUM, TOTAL (UG/L AS SE)	SELE- NIUM, DIS- SOLVED (UG/L AS SE)	SILVER, TOTAL RECOV- ERABLE (UG/L AS AG)	SILVER, DIS- SOLVED (UG/L AS AG)	ZINC, TOTAL RECOV- ERABLE (UG/L AS ZN)	ZINC, DIS- SOLVED (UG/L AS ZN)	CARBON, ORGANIC DIS- SOLVED (MG/L AS C)	CARBON, ORGANIC SUS- PENDE TOTAL (MG/L AS C)
JAN 12...	<.5	0	0	0	0	50	10	3.9	1.0
APR 19...	<.5	0	0	0	0	10	10	2.6	.6
JUL 18...	.5	0	0	0	0	10	10	6.6	--

QUALITATIVE AND ASSOCIATED QUANTITATIVE ANALYSES OF BIOLOGICAL DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
PERIPHYTON

DATE	TIME	LENGTH OF EXPO- SURE (DAYS)	PERI- PHYTON BIOMASS ASH WEIGHT G/SQ M	PERI- PHYTON BIOMASS TOTAL DRY WEIGHT G/SQ M	CHLOR-A PERI- PHYTON CHROMO- FLUOROM (MG/M2)	CHLOR-B PERI- PHYTON CHROMO- FLUOROM (MG/M2)
FEB 14...	1100	33	.000	.000	.000	.000
JUL 18...	0945	41	7.48	11.2	.410	.000

04137500 AU SABLE RIVER NEAR AU SABLE, MI--CONTINUED

SPECIFIC CONDUCTANCE (MICROMHOS/CM AT 25 DEG. C); WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
ONCE-DAILY

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1							---	260	305	300	285	295
2							---	258	295	295	290	295
3							---	255	300	300	285	300
4							---	255	305	295	290	295
5							---	255	305	300	280	300
6							---	250	305	300	285	295
7							---	255	310	300	280	295
8							---	255	310	295	280	300
9							---	255	305	300	280	295
10							---	255	300	300	280	300
11							---	250	305	300	280	300
12							---	258	295	300	280	295
13							---	260	300	300	280	300
14							---	255	295	305	280	300
15							---	255	305	295	280	295
16							---	260	305	300	280	300
17							---	260	295	300	280	300
18							---	280	285	300	280	300
19							---	285	280	295	280	295
20							280	280	290	295	280	295
21							280	280	290	290	290	300
22							285	278	290	290	300	300
23							270	285	295	290	300	300
24							265	290	290	290	300	300
25							270	290	295	295	300	300
26							265	300	295	295	300	295
27							265	265	295	290	295	300
28							260	300	300	290	300	295
29							260	300	295	290	295	300
30							260	300	295	250	300	300
31							---	305	---	285	295	---
MAX								305	310	305	300	300
MTN								250	280	250	280	295

TEMPERATURE (DEG. C) OF WATER, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
ONCE-DAILY

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1							---	8.0	19.5	21.0	23.0	21.0
2							---	8.0	20.0	21.0	23.5	21.0
3							---	9.0	19.5	21.0	21.5	21.0
4							---	8.0	20.0	21.0	21.5	20.0
5							---	8.5	19.5	21.0	22.0	20.0
6							---	9.5	19.5	23.0	21.5	21.0
7							---	10.0	20.0	23.0	22.0	21.5
8							---	10.0	20.0	23.0	21.0	21.0
9							---	10.0	19.0	22.5	23.5	21.0
10							---	10.0	18.0	22.0	22.0	20.0
11							---	10.0	18.0	21.0	21.5	20.0
12							---	10.0	20.0	22.0	22.0	20.0
13							---	10.0	19.0	22.0	22.0	19.5
14							---	11.0	18.5	21.0	22.5	19.5
15							---	11.0	18.5	22.0	23.5	19.0
16							---	11.0	19.5	22.0	23.0	19.5
17							---	12.0	19.0	23.0	23.0	19.5
18							---	12.0	20.0	23.0	23.0	19.5
19							---	14.0	20.0	22.5	23.0	19.0
20							4.0	15.0	19.5	22.0	23.0	19.0
21							3.0	15.0	20.0	23.0	22.0	19.0
22							3.0	14.0	20.0	22.5	22.0	18.0
23							4.0	15.0	20.0	23.0	23.0	17.5
24							4.5	15.0	20.0	24.0	23.0	16.0
25							5.0	15.5	20.0	23.5	23.0	15.0
26							5.0	15.0	20.0	24.0	23.0	15.0
27							6.0	17.0	22.0	23.5	22.5	15.0
28							6.0	17.0	22.5	23.0	22.5	15.0
29							7.0	18.0	23.0	22.5	22.0	15.0
30							8.5	18.5	22.0	22.5	22.0	15.0
31							---	19.0	---	21.0	20.5	---
MAX								19.0	23.0	24.0	23.5	21.5
MIN								8.0	18.0	21.0	20.5	15.0

## STREAMS TRIBUTARY TO LAKE HURON

04138500 AU GRES RIVER NEAR NATIONAL CITY, MI

LOCATION.--Lat 44°10'26", long 83°44'36", in NE¼ NE¼ sec.31, T.21 N., R.6 E., Iosco County, Hydrologic Unit 04080101, on left bank 15 ft (5 m) upstream from highway bridge on Allen Road, 1.7 mi (2.7 km) upstream from Elm Creek, 4.4 mi (7.1 km) southwest of National City, 12.8 mi (20.6 km) southwest of Tawas City, and 13 mi (21 km) upstream from mouth.

DRAINAGE AREA.--169 mi<sup>2</sup> (438 km<sup>2</sup>).

PERIOD OF RECORD.--October 1950 to current year. Monthly discharge only October, November, 1950, published in WSP 1727.

REVISED RECORDS.--WSP 1911: 1959-60.

GAGE.--Water-stage recorder. Datum of gage is 616.24 ft (187.830 m) National Geodetic Vertical Datum of 1929 (levels by U.S. Department of Agriculture). Prior to Oct. 1, 1951, nonrecording gage at site 1.5 mi (2.4 km) upstream at different datum. Oct. 1, 1951 to July 24, 1969, water-stage recorder at site 50 ft (15 m) downstream at present datum.

REMARKS.--Records good except those for the winter period, which are fair. Some regulation at low flows. Several observations of water temperature were made during the year.

AVERAGE DISCHARGE.--28 years, 96.5 ft<sup>3</sup>/s (2.733 m<sup>3</sup>/s), 7.75 in/yr (197 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 2,720 ft<sup>3</sup>/s (77.0 m<sup>3</sup>/s) Mar. 21, 1976; maximum gage height, 10.64 ft (3.243 m) Mar. 6, 1974, backwater from ice; minimum discharge, 5.9 ft<sup>3</sup>/s (0.17 m<sup>3</sup>/s) Nov. 3, 1966, result of freezeup.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 1,140 ft<sup>3</sup>/s (32.3 m<sup>3</sup>/s) Apr. 7, gage height, 5.35 ft (1.631 m); minimum, 14 ft<sup>3</sup>/s (0.40 m<sup>3</sup>/s) July 16, 17, Aug. 13; minimum gage height, 0.77 ft (0.235 m) July 16, 17.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	58	35	320	68	51	50	756	61	82	21	18	17
2	101	37	500	67	50	50	765	60	65	21	18	16
3	66	36	330	66	50	50	617	56	51	21	37	18
4	51	35	180	66	50	50	504	53	67	19	23	18
5	44	34	160	66	50	50	583	52	53	19	19	17
6	38	32	140	66	50	50	724	51	50	19	17	17
7	35	36	135	66	50	50	1050	50	40	18	16	16
8	129	58	130	65	50	50	811	52	39	18	16	19
9	233	59	130	65	50	50	520	69	31	18	17	18
10	127	84	125	64	49	51	405	70	26	18	16	17
11	97	84	125	64	49	52	437	63	26	17	16	17
12	118	62	120	63	49	52	426	67	26	17	17	61
13	92	50	115	62	49	53	368	152	27	16	15	39
14	76	45	107	62	49	54	311	226	23	17	16	99
15	63	48	108	61	49	54	268	212	23	16	16	95
16	59	60	106	60	49	55	240	188	24	16	17	50
17	52	70	110	59	50	56	218	152	31	15	19	85
18	47	83	187	58	50	57	204	110	180	16	19	148
19	62	78	312	58	50	58	232	87	149	17	23	191
20	52	128	343	57	50	60	240	80	118	22	23	101
21	43	200	280	56	50	63	220	102	94	87	18	101
22	39	131	230	56	50	66	198	86	80	47	17	102
23	34	99	180	55	50	74	183	97	65	41	16	82
24	37	96	150	54	50	80	183	116	47	26	16	79
25	43	83	135	54	50	90	173	110	30	21	17	73
26	41	81	130	54	50	95	161	104	29	20	17	64
27	38	100	120	53	50	200	152	99	31	21	17	55
28	36	94	110	52	50	520	123	77	36	20	26	56
29	35	90	100	52	---	570	113	47	32	20	25	51
30	35	90	76	52	---	807	82	49	24	21	19	44
31	35	---	70	51	---	579	---	68	---	19	18	---
TOTAL	2018	2218	5364	1852	1394	4196	11267	2866	1599	704	584	1766
MEAN	65.1	73.9	173	59.7	49.8	135	376	92.5	53.3	22.7	18.8	58.9
MAX	233	200	500	68	51	807	1050	226	180	87	37	191
MIN	34	32	70	51	49	50	82	47	23	15	15	16
CFSM	.39	.44	1.02	.35	.30	.80	2.23	.55	.32	.13	.11	.35
IN.	.44	.49	1.18	.41	.31	.92	2.48	.63	.35	.15	.13	.39

CAL YR 1977 TOTAL 21972 MEAN 60.2 MAX 500 MIN 11 CFSM .36 IN 4.84  
WTR YR 1978 TOTAL 35828 MEAN 98.2 MAX 1050 MIN 15 CFSM .58 IN 7.89



## STREAMS TRIBUTARY TO LAKE HURON

271

## 04140500 RIFLE RIVER AT SELKIRK, MI

LOCATION.--Lat 44°18'48", long 84°04'10", in SE¼ NE¼ sec.9, T.22 N., R.3 E., Ogemaw County, Hydrologic Unit 04080101, on left bank at upstream side of bridge on State Road at Selkirk, 1.0 mi (1.6 km) downstream from Klacking Creek.

DRAINAGE AREA.--117 mi<sup>2</sup> (303 km<sup>2</sup>).

PERIOD OF RECORD.--September 1950 to current year.

REVISED RECORDS.--WSP 2111: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 828.47 ft (252.518 m) National Geodetic Vertical Datum of 1929.

REMARKS.--Records good except those for the winter period, which are fair. Some regulation by dams above station. Several observations of water temperature were made during the year.

AVERAGE DISCHARGE.--28 years, 143 ft<sup>3</sup>/s (4.050 m<sup>3</sup>/s), 16.60 in/yr (422 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 2,760 ft<sup>3</sup>/s (78.2 m<sup>3</sup>/s) May 20, 1959, gage height, 6.76 ft (2.060 m); minimum, 52 ft<sup>3</sup>/s (1.47 m<sup>3</sup>/s) July 23, 1977.

EXTREMES FOR CURRENT YEAR.--Peak discharges above base of 500 ft<sup>3</sup>/s (14.2 m<sup>3</sup>/s) and maximum (\*):

Date	Time	Discharge (ft <sup>3</sup> /s) (m <sup>3</sup> /s)	Gage height (ft) (m)	Date	Time	Discharge (ft <sup>3</sup> /s) (m <sup>3</sup> /s)	Gage height (ft) (m)
Mar. 5	2300	ice jam	*3.98 1.213	Apr. 7	2000	*957 27.1	3.87 1.180
Apr. 2	2000	587 16.6	3.03 0.924	May 14	1700	512 14.5	2.86 0.872

Minimum discharge, 64 ft<sup>3</sup>/s (1.81 m<sup>3</sup>/s) Aug. 15, gage height, 1.51 ft (0.460 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	157	120	220	120	110	110	433	124	101	81	76	82
2	195	126	370	120	110	110	508	118	100	85	76	78
3	159	125	320	120	110	110	437	114	95	80	94	78
4	136	126	220	120	110	110	353	113	94	78	83	76
5	124	121	175	120	110	112	443	113	103	76	80	74
6	116	120	160	120	110	115	579	115	99	75	77	75
7	109	123	150	120	110	120	831	115	94	74	75	73
8	176	129	145	120	108	122	856	123	156	75	74	80
9	301	133	145	120	108	125	625	159	147	74	70	80
10	281	147	140	120	105	125	440	148	120	75	68	80
11	210	152	140	120	105	125	411	134	103	71	67	84
12	225	141	135	120	105	125	402	154	102	70	67	163
13	207	129	135	118	105	125	363	312	105	71	68	140
14	176	126	140	118	105	123	310	465	94	74	67	270
15	157	128	145	115	105	122	251	453	91	71	65	306
16	148	134	148	115	105	118	223	294	96	69	75	195
17	139	130	154	115	108	116	214	231	107	68	76	202
18	139	128	217	115	108	117	199	197	270	68	71	290
19	136	128	257	115	108	117	209	174	421	72	81	385
20	130	165	266	115	108	115	223	164	272	80	75	306
21	127	268	250	112	110	119	206	178	166	90	72	270
22	130	224	210	112	110	123	185	151	136	92	68	223
23	121	178	185	110	110	137	173	137	119	86	68	163
24	124	160	175	110	110	146	173	129	110	79	70	140
25	118	150	170	110	110	143	171	120	104	76	76	129
26	118	155	165	110	110	141	161	114	106	75	74	118
27	118	160	160	110	110	138	150	109	101	79	78	113
28	117	135	150	110	110	173	140	105	94	73	130	124
29	117	115	140	110	---	257	135	101	88	80	125	118
30	119	105	130	110	---	270	132	97	84	81	95	127
31	116	---	125	110	---	302	---	104	---	75	86	---
TOTAL	4746	4281	5642	3580	3033	4311	9936	5165	3878	2373	2427	4642
MEAN	153	143	182	115	108	139	331	167	129	76.5	78.3	155
MAX	301	268	370	120	110	302	856	465	421	92	130	385
MIN.	109	105	125	110	105	110	132	97	84	68	65	73
CFSM	1.31	1.22	1.56	.98	.92	1.19	2.83	1.43	1.10	.65	.67	1.33
IN.	1.51	1.36	1.79	1.14	.96	1.37	3.16	1.64	1.23	.75	.77	1.48

CAL YR 1977 TOTAL 46086 MEAN 126 MAX 466 MIN 56 CFSM 1.08 IN 14.65  
WTR YR 1978 TOTAL 54014 MEAN 148 MAX 856 MIN 65 CFSM 1.27 IN 17.17

## STREAMS TRIBUTARY TO LAKE HURON

04141000 SOUTH BRANCH SHEPARD'S CREEK NEAR SELKIRK, MI

LOCATION.--Lat 44°18'28", long 84°05'13", in SE $\frac{1}{4}$  SE $\frac{1}{4}$  sec.8, T.22 N., R.3 E., Ogemaw County, Hydrologic Unit 04080101, on right bank 200 ft (61 m) upstream from mouth, 600 ft (183 m) west of bridge on Bedtelyon Road, and 1.1 mi (1.8 km) southwest of Selkirk.

DRAINAGE AREA.--1.15 mi<sup>2</sup> (2.98 km<sup>2</sup>).

PERIOD OF RECORD.--October 1951 to September 1978 (discontinued as a continuous-record station; converted to a crest-stage partial-record station).

REVISED RECORDS.--WSP 1557: 1952(M), 1954(M), 1955(P). WSP 2111: Drainage area.

GAGE.--Water-stage recorder and V notch sharp-crested weir. Altitude of gage is 845 ft (258 m), by barometer.

REMARKS.--Records good except those for the winter period and those for period of no gage-height record, Jan. 6 to Feb. 14, which are poor. Several observations of water temperature were made during the year.

AVERAGE DISCHARGE.--27 years, 0.54 ft<sup>3</sup>/s (0.0153 m<sup>3</sup>/s), 6.38 in/yr (162 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 181 ft<sup>3</sup>/s (5.13 m<sup>3</sup>/s) Apr. 3, 1956, from rating curve extended above 40 ft<sup>3</sup>/s (1.13 m<sup>3</sup>/s); maximum gage height, 4.42 ft (1.347 m) Apr. 3, 1956, May 28, 1973; no flow at times each year, except 1956, and 1967-78.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 45 ft<sup>3</sup>/s (1.27 m<sup>3</sup>/s) Apr. 6, gage height, 3.26 ft (0.994 m), only peak above base of 20 ft<sup>3</sup>/s (0.57 m<sup>3</sup>/s); minimum, 0.01 ft<sup>3</sup>/s (<0.001 m<sup>3</sup>/s) on several days in July, Aug. and Sept.; minimum gage height, 1.07 ft (0.326 m) Aug. 15.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	.54	.18	6.1	.10	.12	.11	11	.17	.07	.04	.03	.03
2	.39	.18	3.1	.11	.12	.11	4.9	.16	.07	.05	.05	.03
3	.23	.17	.99	.11	.12	.11	2.3	.15	.07	.04	.05	.03
4	.18	.16	.40	.11	.12	.10	5.1	.16	.08	.03	.03	.03
5	.16	.14	.27	.11	.12	.10	11	.16	.10	.03	.03	.03
6	.14	.14	.20	.12	.12	.10	13	.16	.08	.03	.02	.02
7	.14	.15	.14	.13	.12	.10	14	.14	.07	.03	.02	.02
8	2.5	.19	.12	.13	.12	.10	3.9	.17	.08	.03	.02	.03
9	1.5	.19	.12	.13	.12	.10	1.8	.20	.07	.03	.01	.03
10	.49	.24	.12	.13	.12	.11	1.6	.17	.05	.03	.01	.03
11	.63	.21	.12	.12	.12	.12	3.2	.14	.05	.02	.02	.07
12	.63	.17	.13	.12	.12	.13	1.6	.41	.08	.02	.02	.21
13	.35	.15	.15	.12	.12	.14	1.2	2.0	.07	.02	.02	.42
14	.25	.13	.17	.12	.12	.18	.69	2.3	.06	.02	.01	1.4
15	.22	.16	.19	.12	.12	.18	.48	1.1	.06	.02	.01	.36
16	.19	.19	.20	.12	.12	.18	.36	.57	.09	.02	.04	.21
17	.18	.16	.31	.12	.12	.18	.32	.34	.12	.02	.03	.82
18	.17	.15	2.7	.12	.12	.18	.28	.23	1.2	.03	.03	1.8
19	.18	.14	2.6	.12	.11	.18	.38	.17	.23	.03	.05	.90
20	.17	1.3	2.1	.12	.11	.18	.35	.19	.16	.03	.04	.78
21	.16	.93	1.1	.12	.11	.19	.28	.18	.13	.09	.03	.75
22	.16	.31	1.0	.12	.11	.22	.22	.14	.11	.06	.03	.28
23	.14	.23	.66	.12	.11	.27	.21	.12	.10	.05	.02	.19
24	.14	.22	.43	.12	.11	.30	.23	.12	.09	.04	.02	.16
25	.14	.20	.34	.12	.11	.28	.21	.10	.08	.04	.02	.13
26	.14	.19	.17	.12	.11	.25	.20	.10	.08	.04	.02	.12
27	.14	.18	.12	.12	.11	.26	.19	.09	.06	.04	.04	.12
28	.14	.18	.11	.12	.11	1.2	.19	.08	.05	.03	.16	.12
29	.14	.18	.10	.12	---	5.6	.18	.08	.04	.04	.07	.11
30	.14	.17	.09	.12	---	6.3	.17	.07	.03	.03	.04	.33
31	.13	---	.09	.12	---	5.4	---	.07	---	.03	.04	---
TOTAL	10.81	7.29	24.44	3.70	3.26	22.96	79.54	10.24	3.63	1.06	1.03	9.56
MEAN	.35	.24	.79	.12	.12	.74	2.65	.33	.12	.034	.033	.32
MAX	2.5	1.3	6.1	.13	.12	6.3	14	2.3	1.2	.09	.16	1.8
MIN	.13	.13	.09	.10	.11	.10	.17	.07	.03	.02	.01	.02
CFSM	.30	.21	.69	.10	.10	.64	2.30	.29	.10	.03	.03	.28
IN.	.35	.24	.79	.12	.11	.74	2.57	.33	.12	.03	.03	.31

CAL YR 1977 TOTAL 133.72 MEAN .37 MAX 10 MIN .01 CFSM .32 IN 4.32  
WTP YR 1978 TOTAL 177.52 MEAN .49 MAX 14 MIN .01 CFSM .43 IN 5.74

## STREAMS TRIBUTARY TO LAKE HURON

273

04142000 RIFLE RIVER NEAR STERLING, MI  
(National stream-quality accounting network station)

LOCATION.--Lat 44°04'21", long 84°01'12", in NE¼ SW¼ sec.5, T.19 N., R.4 E., Arenac County, Hydrologic Unit 04080101, on left bank 30 ft (9 m) downstream from bridge on Old M-70, 2.8 mi (4.5 km) north of Sterling, and 20 mi (32 km) upstream from mouth.

DRAINAGE AREA.--320 mi<sup>2</sup> (830 km<sup>2</sup>), approximately.

## WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--November 1905 to December 1908 (gage heights and discharge measurements only), October 1936 to current year. Monthly discharge only for some periods, published in WSP 1307. Published as Rifle River at Michigan Highway 70 near Sterling 1936-61.

REVISED RECORDS.--WSP 1437: 1937 (M), 1939-40 (M).

GAGE.--Water-stage recorder. Datum of gage is 649.48 ft (197.962 m) National Geodetic Vertical Datum of 1929. November 1905 to December 1908, nonrecording gage at site 400 ft (122 m) downstream at different datum. Jan. 13, 1937, to Jan. 10, 1939, nonrecording gage at same site and datum.

REMARKS.--Water-discharge records good except those for the winter period, which are fair. Occasional regulation by dams above station.

AVERAGE DISCHARGE.--42 years, 307 ft<sup>3</sup>/s (8.694 m<sup>3</sup>/s), 13.03 in/yr (331 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 5,340 ft<sup>3</sup>/s (151 m<sup>3</sup>/s) Mar. 28, 1950, gage height, 13.74 ft (4.188 m), from rating curve extended above 3,800 ft<sup>3</sup>/s (108 m<sup>3</sup>/s); minimum, 75 ft<sup>3</sup>/s (2.12 m<sup>3</sup>/s) Nov. 22, 1964, result of freezeup.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 2,170 ft<sup>3</sup>/s (61.5 m<sup>3</sup>/s) Apr. 8, gage height, 7.68 ft (2.341 m), only peak above base of 1,600 ft<sup>3</sup>/s (45.3 m<sup>3</sup>/s); minimum, 121 ft<sup>3</sup>/s (3.43 m<sup>3</sup>/s) Dec. 8; minimum gage height, 1.32 ft (0.402 m) Aug. 16.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
4EAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	234	205	425	220	210	220	1150	276	220	169	144	147
2	315	205	760	220	210	220	1240	278	212	171	143	144
3	306	208	660	220	210	225	1180	273	194	170	186	142
4	243	201	420	220	210	225	984	263	195	158	166	139
5	216	156	330	220	210	230	1140	253	203	156	149	137
6	202	190	270	220	210	230	1480	247	201	153	144	140
7	211	192	230	220	210	230	2020	240	187	151	147	136
8	278	204	195	220	210	230	2080	241	207	150	140	137
9	539	209	190	220	215	230	1590	295	262	149	140	142
10	561	226	185	220	215	230	1120	304	215	150	133	143
11	403	240	185	220	215	230	1060	271	191	146	132	147
12	392	226	190	220	215	235	998	277	194	141	134	268
13	365	215	195	220	215	240	907	549	197	141	132	276
14	309	213	205	220	215	240	737	958	182	149	131	470
15	271	211	230	220	215	240	656	995	173	144	130	562
16	260	219	260	215	215	245	550	728	185	141	137	436
17	260	220	300	215	215	245	488	553	209	138	149	371
18	240	211	400	215	215	250	452	463	565	136	142	564
19	232	207	540	215	215	255	451	407	684	143	154	734
20	221	264	520	215	215	255	478	399	573	155	151	617
21	210	460	490	215	215	255	445	480	357	194	139	505
22	216	422	430	215	215	260	395	411	277	194	134	457
23	231	318	380	215	220	260	360	349	235	181	132	338
24	236	299	330	215	220	270	372	331	214	161	132	241
25	216	279	330	215	220	280	365	296	209	151	135	253
26	202	247	280	215	220	290	341	267	209	151	139	230
27	195	260	265	215	220	300	326	246	201	155	143	220
28	189	260	250	215	222	400	307	233	185	149	195	224
29	186	250	240	210	---	670	314	236	175	144	244	222
30	199	240	230	210	---	770	292	219	167	155	183	276
31	209	---	225	210	---	859	---	223	---	149	158	---
TOTAL	8355	7290	10140	6725	6012	9319	24328	11563	7482	4795	4625	8630
MEAN	270	243	327	217	215	301	811	373	249	155	149	244
MAX	561	460	760	220	222	859	2080	995	684	194	249	734
MIN	186	190	185	210	210	220	292	219	167	136	130	136
CFSM	.84	.76	1.02	.68	.67	.94	2.53	1.17	.78	.48	.47	.42
IN.	.97	.85	1.18	.78	.70	1.08	2.83	1.34	.47	.56	.54	1.03

CAL YR 1977 TOTAL 84923 MEAN 233 MAX 992 MIN 115 CFSM .73 IN 4.87  
WTR YR 1978 TOTAL 109464 MEAN 300 MAX 2080 MIN 130 CFSM .94 IN 12.73

## STREAMS TRIBUTARY TO LAKE HURON

04142000 RIFLE RIVER NEAR STERLING, MI--CONTINUED

## WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1966-72, 1975 to current year.

PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE: November 1974 to current year.

WATER TEMPERATURES: November 1974 to current year,

SUSPENDED-SEDIMENT DISCHARGE: Water year 1970.

INSTRUMENTATION.--Water-quality monitor since August 1975.

REMARKS.--In addition to water-quality monitor, samples were collected near the monitor site by a local observer on an approximate twice-weekly basis. Monthly samples are collected as a cross-section sample at or near vicinity of bridge. Interruptions in the daily record are due to malfunctions of the instrument.

EXTREMES FOR PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE: Maximum recorded, 512 micromhos Jan. 19, 20, 22-24, 1978; minimum, 157 micromhos Aug. 31, 1975.

WATER TEMPERATURES: Maximum, 30.5°C July 20, 1977; minimum, 0.0°C on many days during winter periods.

## WATER QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DATE	TIME	STREAM- FLOW, INSTAN- TANEOUS (CFS)	SPE- CIFIC CON- DUCT- ANCE (MICRO- MHOS)	PH (UNITS)	TEMPER- ATURE (DEG C)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION)	COLI- FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML)	STREP- TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML)	HARD- NESS (MG/L AS CAC03)	HARD- NESS, NONCAR- BONATE (MG/L CAC03)
OCT											
06...	1445	197	461	8.2	12.0	11.8	110	K27	740	240	46
NOV											
10...	1350	231	455	8.3	9.5	9.5	86	36	27	230	41
DEC											
08...	1500	195	514	8.1	.0	12.0	84	K16	85	250	59
JAN											
11...	1030	220	500	7.8	.0	12.7	88	23	100	230	58
FEB											
13...	1400	213	460	7.8	.0	11.8	82	62	83	220	31
MAR											
21...	1330	252	480	8.0	.0	10.4	73	K11	116	210	30
APR											
18...	1115	459	385	8.0	6.5	12.4	102	K7	K8	170	27
MAY											
16...	1130	720	395	8.0	12.0	10.0	93	150	K480	180	29
JUN											
06...	1130	206	455	8.2	17.5	10.1	110	K24	94	210	34
JUL											
17...	1045	137	430	8.2	19.5	9.5	110	33	K20	220	31
AUG											
22...	1030	131	435	8.3	18.5	9.4	102	33	40	220	44
SEP											
19...	1130	758	445	8.0	14.5	9.6	94	4900	3800	210	66

DATE	CALCIUM DIS- SOLVED (MG/L AS CA)	MAGNE- SIUM, DIS- SOLVED (MG/L AS MG)	SODIUM, DIS- SOLVED (MG/L AS NA)	SODIUM AD- SORP- TION RATIO	SODIUM PERCENT	POTAS- SIUM, DIS- SOLVED (MG/L AS K)	BICAR- BONATE (MG/L AS HC03)	CAR- BONATE (MG/L AS CO3)	ALKA- LINITY (MG/L AS CAC03)	CARBON DIOXIDE DIS- SOLVED (MG/L AS CO2)	SULFATE DIS- SOLVED (MG/L AS SO4)
OCT											
06...	66	17	11	.3	9	1.4	230	0	190	2.3	37
NOV											
10...	66	16	12	.3	10	1.4	230	0	190	1.8	35
DEC											
08...	71	17	14	.4	11	1.8	230	0	190	2.9	50
JAN											
11...	68	15	13	.4	11	1.3	210	0	170	5.3	40
FEB											
13...	63	16	11	.3	10	1.1	230	0	190	5.8	37
MAR											
21...	61	15	13	.4	12	1.3	220	0	180	3.5	40
APR											
18...	50	12	8.0	.3	9	1.5	180	0	150	2.9	33
MAY											
16...	51	12	8.0	.3	9	1.7	180	0	150	2.9	33
JUN											
06...	61	15	11	.3	10	1.1	220	0	180	2.2	31
JUL											
17...	60	17	11	.3	10	1.0	230	0	190	2.3	22
AUG											
22...	62	17	11	.3	10	1.1	220	0	180	1.8	30
SEP											
19...	59	14	11	.3	10	2.1	170	0	140	2.7	56

K--Results based on colony count outside the acceptable range (non-ideal colony count)

STREAMS TRIBUTARY TO LAKE HURON  
04142000 RIFLE RIVER NEAR STERLING, MI--CONTINUED

275

WATER-QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978--CONTINUED

DATE	CHLORIDE, DIS- SOLVED (MG/L AS CL)	FLUORIDE, DIS- SOLVED (MG/L AS F)	SILICA, DIS- SOLVED (MG/L AS SiO2)	SOLIDS, RESIDUE AT 180 DEG. C DIS- SOLVED (MG/L)	SOLIDS, SUM OF CONSTITUENTS, DIS- SOLVED (MG/L)	SOLIDS, DIS- SOLVED (TONS PER DAY)	NITRO- GEN, NO2+NO3 TOTAL (MG/L AS N)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N)	NITRO- GEN, ORGANIC TOTAL (MG/L AS N)	NITRO- GEN,AM- MONIA + ORGANIC TOTAL (MG/L AS N)
OCT 06...	15	.1	9.0	256	270	136	.08	.01	--	--
NOV 10...	17	.2	8.9	281	270	175	.16	.03	--	--
DEC 08...	23	.1	9.6	316	300	166	.44	.02	--	--
JAN 11...	21	.1	9.4	306	271	182	.32	.05	--	--
FEB 13...	16	.1	10	276	267	159	.26	.22	.24	.46
MAR 21...	21	.1	9.5	276	269	188	.23	.02	.36	.38
APR 18...	14	.1	5.6	261	213	323	.20	.04	.72	.76
MAY 16...	14	.1	6.7	246	215	478	.23	.04	.84	.88
JUN 06...	17	.1	5.4	286	250	159	.03	.03	.33	.36
JUL 17...	18	.1	5.5	258	248	95.4	.00	.01	.33	.34
AUG 22...	17	.1	6.6	270	253	95.5	.00	.02	.38	.40
SEP 19...	19	.1	8.8	280	254	573	.32	.04	1.2	1.2

DATE	NITRO- GEN, NH4 + ORG. SUSP. TOTAL (MG/L AS N)	NITRO- GEN, AM- MONIA + ORGANIC DIS- (MG/L AS N)	NITRO- GEN, TOTAL (MG/L AS N)	NITRO- GEN, TOTAL (MG/L AS NO3)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, DIS- SOLVED (MG/L AS P)	CARBON, ORGANIC TOTAL (MG/L AS C)	SEDI- MENT, SUS- PENDE (MG/L)	SEDI- MENT CHARGE, SUS- PENDE (T/DAY)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM
OCT 06...	--	.28	--	--	.01	.01	--	8	4.3	100
NOV 10...	--	.31	--	--	.04	.02	13	41	26	100
DEC 08...	--	.39	--	--	.02	.01	17	9	4.7	100
JAN 11...	--	.00	--	--	.03	.00	--	7	4.2	100
FEB 13...	.15	.31	.72	3.2	.03	.02	3.6	10	5.8	100
MAR 21...	.21	.17	.61	2.7	.02	.01	5.4	13	8.8	100
APR 18...	.37	.39	.96	4.3	.05	.02	--	38	47	100
MAY 16...	.81	.07	1.1	4.9	.05	.01	9.0	72	140	100
JUN 06...	.14	.22	.39	1.7	.01	.00	6.4	7	3.9	100
JUL 17...	.00	.39	.34	1.5	.00	.00	--	5	1.8	100
AUG 22...	.03	.37	.40	1.8	.01	.00	10	16	5.7	100
SEP 19...	.74	.46	1.5	6.7	.12	.02	17	131	268	100



STREAMS TRIBUTARY TO LAKE HURON  
04142000 RIFLE RIVER NEAR STERLING, MI--CONTINUED

WATER-QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978--CONTINUED

DATE	TIME	ARSENIC TOTAL (UG/L AS AS)	ARSENIC DIS- SOLVED (UG/L AS AS)	BARIUM, TOTAL RECOV- ERABLE (UG/L AS BA)	BARIUM, DIS- SOLVED (UG/L AS BA)	CADMIUM TOTAL RECOV- ERABLE (UG/L AS CD)	CADMIUM DIS- SOLVED (UG/L AS CD)	CHRO- MIUM, TOTAL RECOV- ERABLE (UG/L AS CR)	CHRO- MIUM, DIS- SOLVED (UG/L AS CR)	COBALT, TOTAL RECOV- ERABLE (UG/L AS CO)
OCT 06...	1445	1	1	0	0	0	0	<10	2	0
JAN 11...	1030	0	0	0	0	1	0	10	3	0
APR 18...	1115	3	2	0	0	0	0	10	1	--
JUL 17...	1045	3	3	100	0	0	0	10	2	0

DATE	COBALT, DIS- SOLVED (UG/L AS CO)	COPPER, TOTAL RECOV- ERABLE (UG/L AS CU)	COPPER, DIS- SOLVED (UG/L AS CU)	IRON, TOTAL RECOV- ERABLE (UG/L AS FE)	IRON, DIS- SOLVED (UG/L AS FE)	LEAD, TOTAL RECOV- ERABLE (UG/L AS PB)	LEAD, DIS- SOLVED (UG/L AS PB)	MANGA- NESE, TOTAL RECOV- ERABLE (UG/L AS MN)	MANGA- NESE, DIS- SOLVED (UG/L AS MN)	MERCURY TOTAL RECOV- ERABLE (UG/L AS HG)
OCT 06...	0	7	1	220	50	--	--	20	20	<.5
JAN 11...	0	10	2	470	90	49	19	40	30	<.5
APR 18...	2	7	3	570	50	0	0	40	20	<.5
JUL 17...	0	2	1	130	30	0	0	20	10	.5

DATE	MERCURY DIS- SOLVED (UG/L AS HG)	SELE- NIUM, TOTAL (UG/L AS SE)	SELE- NIUM, DIS- SOLVED (UG/L AS SE)	SILVER, TOTAL RECOV- ERABLE (UG/L AS AG)	SILVER, DIS- SOLVED (UG/L AS AG)	ZINC, TOTAL RECOV- ERABLE (UG/L AS ZN)	ZINC, DIS- SOLVED (UG/L AS ZN)	CARBON, ORGANIC DIS- SOLVED (MG/L AS C)	CARBON, ORGANIC SUS- PENDED TOTAL (MG/L AS C)
OCT 06...	<.5	0	0	0	0	10	0	13	--
JAN 11...	<.5	0	0	0	0	60	20	9.3	--
APR 18...	<.5	0	0	0	0	10	10	3.4	1.0
JUL 17...	.5	0	0	0	0	10	10	3.8	.4

QUALITATIVE AND ASSOCIATED QUANTITATIVE ANALYSES OF BIOLOGICAL DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
PERIPHYTON

DATE	TIME	LENGTH OF EXPO- SURE (DAYS)	PERI- PHYTON BIOMASS ASH WEIGHT G/SQ M	PERI- PHYTON BIOMASS TOTAL DRY WEIGHT G/SQ M	CHLOR-A PERI- PHYTON CHROMO- GRAPHIC FLUOROM (MG/M2)	CHLOR-B PERI- PHYTON CHROMO- GRAPHIC FLUOROM (MG/M2)
NOV 10...	1350	35	--	--	--	--
FEB 13...	1400	33	.079	.157	.060	.000
JUN 06...	1130	21	2.76	4.25	.490	.000

STREAMS TRIBUTARY TO LAKE HURON  
04142000 RIFLE RIVER NEAR STERLING, MI--CONTINUED

277

SPECIFIC CONDUCTANCE (MICROMHOS/CM AT 25 DEG. C), WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
OCTOBER			NOVEMBER			DECEMBER			JANUARY			
1	432	410	418	---	---	---	---	---	---	460	455	457
2	428	410	416	---	---	---	---	---	---	470	463	468
3	437	426	430	---	---	---	---	---	---	476	469	474
4	445	428	435	---	---	---	---	---	---	478	468	472
5	442	437	438	---	---	---	---	---	---	472	459	466
6	457	434	442	---	---	---	---	---	---	464	450	455
7	451	438	444	---	---	---	---	---	---	455	448	453
8	445	415	426	---	---	---	---	---	---	453	449	451
9	465	414	436	---	---	---	453	413	443	468	457	463
10	418	407	411	---	---	---	468	457	463	483	472	478
11	432	421	428	456	452	454	465	457	461	503	487	496
12	447	435	443	455	449	452	466	461	463	506	497	503
13	447	444	445	451	440	447	465	441	455	497	492	494
14	447	442	445	445	440	443	443	423	431	500	494	497
15	446	442	444	445	433	440	427	417	422	504	500	502
16	445	426	439	448	429	440	421	410	416	509	504	507
17	430	424	427	452	447	450	414	407	411	511	508	510
18	432	424	429	454	450	452	410	394	403	511	511	511
19	---	---	---	455	443	451	395	368	379	512	511	512
20	---	---	---	449	425	434	378	374	376	512	512	512
21	---	---	---	457	431	446	381	378	379	511	511	511
22	---	---	---	440	430	436	392	385	388	512	511	511
23	---	---	---	446	443	444	401	395	399	512	512	512
24	---	---	---	452	448	450	412	405	409	512	512	512
25	---	---	---	455	447	450	423	416	418	511	511	511
26	---	---	---	463	454	458	---	---	---	511	509	509
27	---	---	---	465	451	461	---	---	---	508	508	508
28	---	---	---	460	445	450	---	---	---	508	507	508
29	---	---	---	---	---	---	467	455	463	506	502	505
30	---	---	---	---	---	---	459	448	454	502	486	494
31	---	---	---	---	---	---	457	454	456	485	478	480
MONTH										512	448	492

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
	FEBRUARY			MARCH			APRIL			MAY		
1	478	476	477	---	---	---	369	330	356	---	---	---
2	475	474	474	---	---	---	332	299	308	---	---	---
3	475	473	474	---	---	---	306	303	305	---	---	---
4	477	474	476	---	---	---	312	309	311	---	---	---
5	478	476	478	---	---	---	320	314	317	---	---	---
6	479	477	478	---	---	---	320	294	309	---	---	---
7	477	477	477	---	---	---	296	290	294	---	---	---
8	478	476	477	---	---	---	296	287	290	---	---	---
9	478	476	477	---	---	---	295	291	292	---	---	---
10	477	475	476	---	---	---	309	299	305	---	---	---
11	478	477	478	---	---	---	319	313	316	---	---	---
12	479	478	478	---	---	---	324	319	322	---	---	---
13	---	---	---	---	---	---	328	326	327	443	409	427
14	---	---	---	---	---	---	339	329	334	416	389	400
15	---	---	---	---	---	---	348	341	344	393	389	391
16	---	---	---	---	---	---	367	351	358	406	402	405
17	---	---	---	---	---	---	382	368	375	---	---	---
18	---	---	---	---	---	---	390	389	390	---	---	---
19	---	---	---	---	---	---	392	384	387	---	---	---
20	---	---	---	---	---	---	389	383	384	431	391	413
21	---	---	---	---	---	---	391	383	387	407	394	403
22	---	---	---	468	460	464	405	394	399	410	401	406
23	---	---	---	464	446	455	411	408	409	426	410	416
24	---	---	---	463	454	458	427	410	415	---	---	---
25	---	---	---	470	460	466	452	423	436	---	---	---
26	---	---	---	471	461	467	468	444	457	---	---	---
27	---	---	---	474	469	472	483	425	460	---	---	---
28	---	---	---	---	---	---	---	---	---	---	---	---
29	---	---	---	425	397	416	---	---	---	---	---	---
30	---	---	---	399	390	395	---	---	---	---	---	---
31	---	---	---	393	369	388	---	---	---	---	---	---

## 04142000 RIFLE RIVER NEAR STERLING, MI--CONTINUED

**SPECIFIC CONDUCTANCE (MICROMHOS/CM AT 25 DEG. C), WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978**

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	---	---	---	---	---	---	422	401	410	438	424	431
2	---	---	---	---	---	---	424	413	419	440	427	434
3	---	---	---	---	---	---	416	411	414	438	428	433
4	---	---	---	---	---	---	434	412	422	434	420	427
5	---	---	---	---	---	---	432	419	426	433	421	428
6	---	---	---	---	---	---	441	424	433	432	424	429
7	445	432	440	422	410	417	439	432	436	424	419	421
8	445	435	441	422	410	418	446	436	440	429	418	424
9	436	413	421	420	400	411	448	441	444	427	421	424
10	434	415	426	418	400	411	447	437	442	429	417	423
11	462	434	444	429	400	416	447	436	442	429	409	423
12	486	464	477	429	414	421	446	436	441	407	400	404
13	482	473	478	425	404	417	451	442	446	411	403	408
14	483	473	478	422	402	415	449	443	446	---	---	---
15	477	473	476	---	---	---	444	439	442	---	---	---
16	473	461	467	---	---	---	440	437	439	---	---	---
17	466	400	441	---	---	---	440	435	437	---	---	---
18	409	367	382	---	---	---	445	438	441	---	---	---
19	397	368	379	---	---	---	441	435	438	---	---	---
20	415	398	409	---	---	---	440	431	435	---	---	---
21	425	415	421	---	---	---	441	427	434	---	---	---
22	429	421	425	---	---	---	443	429	437	---	---	---
23	435	424	430	---	---	---	445	435	440	---	---	---
24	443	437	440	---	---	---	447	440	443	---	---	---
25	442	426	434	422	405	416	446	438	442	---	---	---
26	448	425	442	420	405	414	448	441	444	---	---	---
27	444	420	436	426	410	419	446	441	443	478	476	477
28	449	432	441	420	407	414	442	438	440	476	474	475
29	447	433	441	416	406	411	440	434	438	474	470	471
30	448	421	440	415	407	410	436	430	433	470	466	469
31	---	---	---	411	400	405	439	428	433	---	---	---
MONTH							451	401	436			

TEMPERATURE (DEG. C) OF WATER, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
	OCTOBER			NOVEMBER			DECEMBER			JANUARY		
1	14.0	12.0	12.5	---	---	---	---	---	---	.0	.0	.0
2	12.0	10.0	11.0	---	---	---	---	---	---	.0	.0	.0
3	12.5	9.5	11.0	---	---	---	---	---	---	.0	.0	.0
4	12.5	9.0	10.5	---	---	---	---	---	---	.0	.0	.0
5	11.5	10.5	11.0	---	---	---	---	---	---	.0	.0	.0
6	11.5	8.0	9.5	---	---	---	---	---	---	.0	.0	.0
7	10.5	8.0	9.0	---	---	---	---	---	---	.0	.0	.0
8	11.0	9.0	10.0	---	---	---	.0	.0	.0	.0	.0	.0
9	10.0	9.5	10.0	---	---	---	.0	.0	.0	.0	.0	.0
10	10.5	8.0	9.5	---	---	---	.0	.0	.0	.0	.0	.0
11	9.5	8.5	9.5	8.5	5.5	7.0	.0	.0	.0	.0	.0	.0
12	9.5	8.0	8.5	5.5	3.5	4.5	.0	.0	.0	.0	.0	.0
13	9.0	7.0	8.0	3.5	1.5	3.0	.0	.0	.0	.0	.0	.0
14	9.5	6.0	7.5	3.5	2.5	3.0	.0	.0	.0	.0	.0	.0
15	8.5	8.0	8.0	4.0	2.0	3.0	.0	.0	.0	.0	.0	.0
16	8.0	6.0	7.0	4.5	3.5	4.0	.0	.0	.0	.0	.0	.0
17	7.0	4.5	5.5	5.0	3.5	4.0	.0	.0	.0	.0	.0	.0
18	7.5	5.0	6.0	4.5	3.5	4.0	.0	.0	.0	.0	.0	.0
19	---	---	---	5.0	3.5	4.0	.0	.0	.0	.0	.0	.0
20	---	---	---	5.5	3.5	4.5	.0	.0	.0	.0	.0	.0
21	---	---	---	4.5	2.0	4.0	.0	.0	.0	.0	.0	.0
22	---	---	---	2.0	1.5	2.0	.0	.0	.0	.0	.0	.0
23	---	---	---	1.5	1.5	1.5	.0	.0	.0	.0	.0	.0
24	---	---	---	2.5	1.5	2.0	.0	.0	.0	.0	.0	.0
25	---	---	---	1.5	.0	.5	.0	.0	.0	.0	.0	.0
26	---	---	---	.0	.0	.0	---	---	---	.0	.0	.0
27	---	---	---	.0	.0	.0	---	---	---	.0	.0	.0
28	---	---	---	.5	.0	.0	---	---	---	.0	.0	.0
29	---	---	---	---	---	---	.0	.0	.0	.0	.0	.0
30	---	---	---	---	---	---	.0	.0	.0	.0	.0	.0
31	---	---	---	---	---	---	.0	.0	.0	.0	.0	.0
MONTH										.0	.0	.0

STREAMS TRIBUTARY TO LAKE HURON  
04142000 RIFLE RIVER NEAR STERLING, MI--CONTINUED

279

TEMPERATURE (DEG. C) OF WATER, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
	FEBRUARY			MARCH			APRIL			MAY		
1	.0	.0	.0	---	---	---	2.0	1.0	1.5	---	---	---
2	.0	.0	.0	---	---	---	2.0	.0	1.0	---	---	---
3	.0	.0	.0	---	---	---	1.0	.5	1.0	---	---	---
4	.0	.0	.0	---	---	---	1.5	1.0	1.5	---	---	---
5	.0	.0	.0	---	---	---	4.5	1.0	2.5	---	---	---
6	.0	.0	.0	---	---	---	3.5	1.5	2.5	---	---	---
7	.0	.0	.0	---	---	---	3.5	1.0	2.5	---	---	---
8	.0	.0	.0	---	---	---	3.5	1.5	3.0	---	---	---
9	.0	.0	.0	---	---	---	3.5	2.0	2.5	---	---	---
10	.0	.0	.0	---	---	---	4.0	2.0	2.5	---	---	---
11	.0	.0	.0	---	---	---	5.0	4.0	4.5	---	---	---
12	.0	.0	.0	---	---	---	6.0	3.5	4.5	---	---	---
13	---	---	---	---	---	---	6.0	5.0	5.5	10.5	10.0	10.5
14	---	---	---	---	---	---	6.5	4.5	5.0	10.5	9.5	10.0
15	---	---	---	---	---	---	5.5	4.0	5.0	10.5	10.0	10.5
16	---	---	---	---	---	---	8.0	4.0	5.5	13.0	11.5	12.0
17	---	---	---	---	---	---	9.0	4.5	6.5	---	---	---
18	---	---	---	---	---	---	7.0	6.0	6.5	---	---	---
19	---	---	---	---	---	---	7.0	5.5	6.0	---	---	---
20	---	---	---	---	---	---	6.5	5.5	7.0	19.0	15.0	17.5
21	---	---	---	---	---	---	9.0	4.5	6.5	18.5	14.0	16.0
22	---	---	---	.0	.0	.0	10.5	6.0	7.5	18.0	13.0	16.0
23	---	---	---	.0	.0	.0	9.5	6.0	8.0	18.0	15.5	16.0
24	---	---	---	.0	.0	.0	12.0	7.0	9.0	---	---	---
25	---	---	---	.0	.0	.0	13.0	7.5	10.0	---	---	---
26	---	---	---	.0	.0	.0	14.0	8.0	10.5	---	---	---
27	---	---	---	.0	.0	.0	14.5	8.5	11.5	---	---	---
28	---	---	---	---	---	---	---	---	---	---	---	---
29	---	---	---	4.0	2.0	3.0	---	---	---	---	---	---
30	---	---	---	3.5	1.5	2.0	---	---	---	---	---	---
31	---	---	---	2.5	2.0	2.0	---	---	---	---	---	---

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
	JUNE			JULY			AUGUST			SEPTEMBER		
1	---	---	---	---	---	---	23.5	18.0	21.0	21.0	15.5	18.5
2	---	---	---	---	---	---	22.5	19.0	21.0	22.5	17.5	20.0
3	---	---	---	---	---	---	23.0	19.5	21.0	21.5	19.0	20.0
4	---	---	---	---	---	---	22.5	17.0	20.0	20.5	16.0	18.5
5	---	---	---	---	---	---	23.0	17.0	20.0	21.5	17.5	19.5
6	---	---	---	---	---	---	24.0	18.0	21.0	21.0	18.5	20.0
7	21.0	17.5	19.0	23.5	18.5	22.0	24.0	19.5	22.0	19.5	18.5	19.0
8	20.0	17.0	18.5	23.0	18.0	20.5	25.0	19.5	22.5	19.5	17.0	18.5
9	21.0	15.5	18.0	22.5	15.5	19.0	26.5	22.0	24.5	19.5	18.0	18.5
10	22.0	15.0	18.0	22.0	16.0	19.0	24.5	19.5	22.5	21.0	16.5	19.0
11	24.0	17.5	20.5	22.5	18.5	20.5	23.5	18.5	21.5	22.5	18.5	20.5
12	22.5	15.5	18.0	23.0	17.0	20.0	24.5	19.5	22.5	20.0	16.0	17.5
13	20.0	14.0	17.0	25.0	19.0	21.5	26.5	21.0	24.0	16.0	14.0	15.0
14	18.5	14.5	16.5	24.0	18.0	21.0	27.5	22.5	25.0	---	---	---
15	19.0	15.0	17.5	---	---	---	27.0	23.0	25.0	---	---	---
16	18.0	16.0	17.0	---	---	---	26.0	23.5	24.5	---	---	---
17	18.5	16.5	17.5	---	---	---	26.0	21.0	23.0	---	---	---
18	21.0	17.5	18.5	---	---	---	24.5	21.0	23.0	---	---	---
19	21.5	17.0	19.5	---	---	---	24.0	22.0	23.0	---	---	---
20	22.0	18.0	20.0	---	---	---	23.5	18.0	21.0	---	---	---
21	22.0	16.5	19.0	---	---	---	23.5	18.0	21.0	---	---	---
22	20.5	16.0	18.0	---	---	---	23.0	18.5	21.0	---	---	---
23	22.0	15.0	18.0	---	---	---	23.0	19.0	21.5	---	---	---
24	26.5	19.5	22.0	---	---	---	23.0	20.5	22.0	---	---	---
25	25.5	20.5	23.0	25.0	20.0	23.0	23.5	19.5	21.5	---	---	---
26	25.0	21.0	22.0	24.0	21.5	23.0	22.5	20.0	21.5	---	---	---
27	24.0	18.5	21.5	25.5	20.5	23.0	22.0	19.5	20.5	13.5	12.5	13.0
28	19.5	17.0	18.0	23.5	18.0	21.5	22.5	19.5	20.5	13.5	10.0	12.0
29	19.5	17.0	18.0	22.5	20.0	21.0	23.0	18.5	20.5	13.0	10.5	11.5
30	22.5	17.0	20.0	22.0	17.5	19.5	21.0	17.5	19.5	13.0	11.5	12.0
31	---	---	---	22.0	16.0	19.0	20.5	16.0	18.5	---	---	---
MONTH							27.5	16.0	22.0			

## STREAMS TRIBUTARY TO LAKE HURON

## 04143500 NORTH BRANCH KAWKAWLIN RIVER NEAR KAWKAWLIN, MI

LOCATION.--Lat 43°40'05", long 83°58'13", in SE¼ SE¼ sec.27, T.15 N., R.4 E., Bay County, Hydrologic Unit 04080102, on left bank 50 ft (15 m) upstream from bridge on Beaver Road, 1.7 mi (2.7 km) northwest of Kawkawlin, and 2.4 mi (3.9 km) upstream from mouth.

DRAINAGE AREA.--101 mi<sup>2</sup> (262 km<sup>2</sup>).

PERIOD OF RECORD.--March 1951 to current year.

GAGE.--Water-stage recorder. Datum of gage is 584.00 ft (178.003 m) National Geodetic Vertical Datum of 1929 (levels by Michigan Department of Natural Resources). Prior to Sept. 26, 1951, nonrecording gage at site 70 ft (21 m) downstream, and Sept. 27, 1951, to Sept. 30, 1960, water-stage recorder at present site, at datum 2.00 ft (0.610 m) higher.

REMARKS.--Records good except those for the winter period, which are poor. Some diversion above station for irrigation. Some regulation during low flows by dams above station. Several observations of water temperature were made during the year. Corps of Engineers gage-height telemark at station.

AVERAGE DISCHARGE.--27 years, 59.1 ft<sup>3</sup>/s (1.674 m<sup>3</sup>/s), 7.95 in/yr (202 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,610 ft<sup>3</sup>/s (45.6 m<sup>3</sup>/s) May 18, 1974, gage height, 10.92 ft (3.328 m); no flow at times in each year.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 805 ft<sup>3</sup>/s (22.8 m<sup>3</sup>/s) Mar. 31, gage height, 8.75 ft (2.667 m); no flow July 14-19, July 30 to Sept. 13.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	29	8.2	60	45	5.0	5.2	790	34	10	7.8	.00	.00
2	30	7.4	90	38	5.0	5.2	731	29	8.3	6.1	.00	.00
3	15	7.0	90	32	4.9	5.2	687	25	6.1	4.5	.00	.00
4	13	6.6	110	27	4.9	5.2	595	21	4.7	3.6	.00	.00
5	29	6.3	142	23	4.9	5.3	525	18	4.1	2.8	.00	.00
6	46	6.3	170	18	4.9	5.4	547	17	3.4	2.2	.00	.00
7	61	6.3	170	15	4.9	5.4	585	15	2.8	1.7	.00	.00
8	69	6.3	110	13	4.9	5.6	566	14	2.7	1.1	.00	.00
9	74	6.3	80	12	4.9	5.8	574	13	2.5	.77	.00	.00
10	64	8.2	60	11	5.0	6.4	489	13	2.0	.54	.00	.00
11	53	8.9	45	10	5.0	6.8	393	13	1.6	.29	.00	.00
12	46	8.7	35	9.2	5.0	7.2	300	14	1.3	.13	.00	.00
13	44	7.9	32	8.4	5.0	7.8	237	25	1.1	.02	.00	.00
14	43	7.6	31	7.6	5.0	8.4	202	38	.78	.00	.00	1.0
15	45	7.6	30	7.0	5.1	9.0	179	40	.63	.00	.00	.66
16	51	8.6	30	6.6	5.1	9.6	157	54	.56	.00	.00	.59
17	51	8.9	31	6.0	5.1	10	136	96	.60	.00	.00	1.3
18	46	8.9	56	5.8	5.1	11	119	120	1.6	.00	.00	5.9
19	39	8.9	94	5.6	5.1	13	108	111	2.2	.00	.00	10
20	33	11	125	5.4	5.1	15	96	94	2.0	1.4	.00	5.9
21	28	15	178	5.2	5.1	60	87	82	1.4	3.9	.00	9.4
22	24	15	259	5.2	5.1	170	78	70	.79	2.7	.00	12
23	20	15	292	5.1	5.1	350	73	60	3.3	1.3	.00	6.9
24	18	18	245	5.1	5.2	480	70	51	49	.33	.00	3.9
25	16	22	200	5.0	5.2	520	65	45	71	.04	.00	2.3
26	14	32	160	5.0	5.2	540	57	41	62	.03	.00	.88
27	13	45	130	5.0	5.2	560	50	38	44	1.0	.00	.68
28	11	41	100	5.0	5.2	580	44	32	27	.45	.00	2.3
29	10	36	78	5.0	---	540	41	25	16	.10	.00	2.3
30	9.5	33	62	5.0	---	550	37	18	11	.00	.00	2.1
31	8.6	---	53	5.0	---	700	---	14	---	.00	.00	---
TOTAL	1053.1	427.9	3348	361.2	141.2	5202.5	8618	1280	344.46	42.80	.00	68.11
MEAN	34.0	14.3	108	11.7	5.04	168	287	41.3	11.5	1.38	.000	2.27
MAX	74	45	292	45	5.2	700	790	120	71	7.8	.00	12
MIN	8.6	6.3	30	5.0	4.9	5.2	37	13	.56	.00	.00	.00
CFSM	.34	.14	1.07	.12	.05	1.66	2.84	.41	.11	.01	.000	.02
IN.	.39	.16	1.23	.13	.05	1.92	3.17	.47	.13	.02	.00	.03

CAL YR 1977 TOTAL 6969.09 MEAN 19.1 MAX 292 MIN .00 CFSM .19 IN 2.57  
WTR YR 1978 TOTAL 20887.27 MEAN 57.2 MAX 790 MIN .00 CFSM .57 IN 7.69



STREAMS TRIBUTARY TO LAKE HURON

281

04143900 SHIawassee RIVER AT LINDEN, MI

LOCATION.--Lat 42°48'56", long 83°48'08", in SW 1/4 sec.19, T.5 N., R.6 E., Genesee County, Hydrologic Unit 04080203, on right bank at upstream side of bridge on Hogan Road, 1.0 mi (1.6 km) west of Linden.

DRAINAGE AREA.--81.2 mi<sup>2</sup> (210.3 km<sup>2</sup>).

PERIOD OF RECORD.--October 1967 to current year.

GAGE.--Water-stage recorder. Datum of gage is 844.96 ft (257.544 m) National Geodetic Vertical Datum of 1929.

REMARKS.--Records good except those for the winter period, which are poor. Flow regulated by dam at Linden since 1967. Several observations of water temperature were made during the year.

AVERAGE DISCHARGE.--11 years, 62.4 ft<sup>3</sup>/s (1.767 m<sup>3</sup>/s), 10.44 in/yr (265 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 476 ft<sup>3</sup>/s (13.5 m<sup>3</sup>/s) Apr. 22, 1975, gage height, 7.43 ft (2.265 m); minimum, 0.74 ft<sup>3</sup>/s (0.021 m<sup>3</sup>/s) May 22, 23, 1971; minimum gage height, 2.82 ft (0.860 m) Aug. 2, 1971.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 189 ft<sup>3</sup>/s (5.35 m<sup>3</sup>/s) Mar. 28, gage height, 5.86 ft (1.786 m); minimum, 1.2 ft<sup>3</sup>/s (0.034 m<sup>3</sup>/s) July 8, gage height, 3.00 ft (0.914 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	54	30	55	56	45	33	158	50	21	23	6.0	6.2
2	51	29	61	58	45	33	156	34	5.7	23	6.6	5.8
3	50	29	62	56	45	32	155	22	7.3	23	9.7	5.7
4	50	28	62	54	45	32	157	6.2	9.4	23	8.4	5.7
5	50	26	62	52	45	32	159	4.6	13	22	7.8	5.3
6	49	26	56	50	45	31	154	4.1	14	21	7.8	5.2
7	48	25	50	48	45	31	155	3.3	16	17	7.8	5.0
8	50	25	47	48	45	31	158	3.5	26	1.6	7.5	5.3
9	50	35	50	48	45	31	154	7.8	34	1.7	7.5	5.5
10	48	37	55	48	45	32	147	12	33	2.0	7.8	5.5
11	44	33	52	47	45	32	131	21	32	2.6	7.5	5.2
12	27	34	45	11	45	32	124	48	34	2.7	7.5	6.8
13	15	51	40	20	45	33	113	90	33	3.3	7.3	8.3
14	15	54	40	25	45	35	106	102	30	3.9	7.0	9.3
15	17	54	45	28	45	37	95	102	28	4.2	7.0	10
16	19	55	50	30	44	40	92	95	27	4.4	7.5	9.8
17	21	53	56	34	41	42	92	78	26	4.4	7.5	11
18	28	52	62	36	40	46	90	74	25	4.6	8.1	13
19	28	51	67	38	39	50	86	73	25	4.8	9.4	12
20	28	53	67	40	38	55	74	73	25	5.0	9.1	22
21	32	53	67	42	37	62	68	73	25	6.2	8.8	31
22	44	53	68	43	37	75	53	73	24	6.5	8.1	36
23	45	53	68	44	36	90	50	73	24	6.5	7.5	35
24	44	52	68	44	36	105	51	70	24	6.8	7.0	28
25	44	51	67	45	35	120	51	58	23	6.2	6.8	18
26	42	50	64	45	34	153	55	51	24	6.2	6.5	13
27	31	49	62	45	34	172	56	39	23	6.5	6.6	15
28	30	49	60	45	34	186	56	37	23	6.2	7.5	15
29	30	49	58	45	---	188	55	36	23	6.2	6.8	17
30	30	49	56	45	---	182	54	36	23	6.7	6.6	17
31	29	---	54	45	---	167	---	29	---	6.3	6.5	---
TOTAL	1143	1288	1776	1315	1160	2220	3105	1478.5	700.4	267.5	233.5	387.6
MEAN	36.9	42.9	57.3	42.4	41.4	71.6	104	47.7	23.3	8.63	7.53	12.9
MAX	54	55	68	58	45	188	159	102	34	23	9.7	36
MIN	15	25	40	11	34	31	50	3.3	5.7	1.6	6.0	5.0
CFSM	.45	.53	.71	.52	.51	.88	1.28	.59	.29	.11	.09	.16
IN.	.52	.59	.81	.60	.53	1.02	1.42	.68	.32	.12	.11	.18

CAL YR 1977 TOTAL 15946.0 MEAN 43.7 MAX 165 MIN 2.5 CFSM .54 IN 7.31  
WTR YR 1978 TOTAL 15074.5 MEAN 41.3 MAX 188 MIN 1.6 CFSM .51 IN 6.91

## STREAMS TRIBUTARY TO LAKE HURON

04144000 SHIAWASSEE RIVER AT BYRON, MI

LOCATION.--Lat 42°49'25", long 83°56'45", in NE¼ NE¼ sec.23, T.5 N., R.4 E., Shiawassee County, Hydrologic Unit 04080203, on left bank at upstream side of highway bridge at Byron, 0.3 mi (0.5 km) downstream from milldams which are just upstream from South Branch Shiawassee River.

DRAINAGE AREA.--368 mi<sup>2</sup> (953 km<sup>2</sup>).

## WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--October 1947 to current year. Monthly discharge only for some periods, published in WSP 1307.

REVISED RECORDS.--WSP 1144: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 812.00 ft (247.498 m), revised, National Geodetic Vertical Datum of 1929. Prior to Oct. 17, 1960, nonrecording gage and crest-stage gage at same site and datum.

REMARKS.--Water-discharge records good except those for the winter period, which are fair. Low flow slightly regulated at times by mills above station.

AVERAGE DISCHARGE.--31 years, 251 ft<sup>3</sup>/s (7.108 m<sup>3</sup>/s), 9.26 in/yr (235 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 3,880 ft<sup>3</sup>/s (110 m<sup>3</sup>/s) Apr. 22, 1975, gage height, 15.25 ft (4.648 m); minimum, 19 ft<sup>3</sup>/s (0.54 m<sup>3</sup>/s), Aug. 16, 1965; minimum gage height, 3.55 ft (1.082 m) Sept. 16, 1960.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 1,260 ft<sup>3</sup>/s (35.7 m<sup>3</sup>/s) Mar. 26, gage height, 9.36 ft (2.853 m); minimum, 25 ft<sup>3</sup>/s (0.71 m<sup>3</sup>/s) Sept. 11, gage height, 3.94 ft (1.201 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	247	94	210	150	165	160	838	199	193	76	38	42
2	196	42	248	150	170	160	811	193	159	73	42	41
3	131	44	285	145	170	160	821	161	108	71	53	40
4	120	43	279	145	175	160	842	127	76	70	57	37
5	112	41	246	140	175	155	935	118	65	68	55	35
6	108	42	221	140	180	155	876	117	57	56	49	39
7	104	49	148	140	180	155	855	115	62	61	46	39
8	106	45	160	140	182	155	790	113	71	64	45	31
9	107	101	150	140	184	155	698	118	83	55	46	33
10	108	100	140	140	182	155	637	140	82	45	46	33
11	109	152	140	140	182	155	550	182	82	41	45	30
12	110	181	140	140	182	155	486	230	88	39	46	30
13	107	180	150	140	180	160	443	244	93	40	50	39
14	109	171	160	140	180	160	423	372	96	38	51	51
15	120	175	190	140	180	170	386	486	95	36	44	63
16	123	184	219	140	180	190	328	504	95	36	45	64
17	102	189	241	140	180	210	249	458	90	32	43	61
18	98	190	254	140	180	240	262	350	87	33	42	78
19	94	187	273	140	180	330	260	220	80	32	46	92
20	94	168	360	140	180	350	244	222	79	33	47	92
21	89	148	412	140	180	450	242	209	82	34	44	87
22	90	153	410	140	175	600	238	193	88	34	43	107
23	107	150	408	145	175	920	212	270	88	35	41	132
24	132	162	377	150	170	1080	192	324	85	37	41	134
25	149	193	342	150	170	1160	146	294	82	36	40	131
26	153	203	219	150	170	1250	178	216	91	36	42	132
27	153	187	200	155	165	1220	172	156	86	38	42	119
28	152	199	180	155	165	1190	172	132	97	37	43	85
29	148	191	170	160	---	1110	167	118	88	37	43	70
30	121	188	160	160	---	993	146	90	82	38	44	68
31	96	---	160	160	---	864	---	127	---	37	41	---
TOTAL	3795	4501	7292	4495	4937	14527	13573	6798	2710	1398	1400	2035
MEAN	122	150	235	145	176	469	452	219	90.3	45.1	45.2	67.8
MAX	247	203	412	160	184	1250	876	504	193	76	57	134
MTN	89	89	140	140	165	155	167	90	57	32	38	30
CFSM	.33	.41	.64	.39	.48	1.27	1.23	.60	.25	.12	.12	.18
IN.	.38	.45	.74	.45	.50	1.47	1.37	.69	.27	.14	.14	.21

CAL YR 1977 TOTAL 68414 MEAN 187 MAX 822 MIN 27 CFSM .51 IN 6.92  
WTR YR 1978 TOTAL 67461 MEAN 185 MAX 1250 MIN 30 CFSM .50 IN 6.82

STREAMS TRIBUTARY TO LAKE HURON  
04144000 SHIAWASSEE RIVER AT BYRON, MI--CONTINUED

283

WATER-QUALITY RECORDS

PERIOD OF DAILY RECORD.--

WATER TEMPERATURES: Water years 1962 to current year.

INSTRUMENTATION.--Temperature recorder since March 1962.

REMARKS.--Temperature recorder clock stopped Mar. 30 to Apr. 20 (range in temperature 1.5°C to 11.0°C), Apr. 29 to May 25 (range in temperature 10.0°C to 22.5°C); no record Oct. 1-24.

EXTREMES FOR PERIOD OF DAILY RECORD.--

WATER TEMPERATURES: Maximum, 29.0°C on several days in 1971, 1974 and 1975; minimum, 0.0°C on many days during winter periods.

EXTREMES FOR CURRENT YEAR.--

WATER TEMPERATURES: Maximum recorded, 26.5°C July 23; minimum, 0.0°C on many days during winter period.

TEMPERATURE (DEG. C) OF WATER, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DAY	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN
	OCTOBER		NOVEMBER		DECEMBER		JANUARY		FEBRUARY		MARCH	
1	---	---	9.5	8.0	1.0	.5	.0	.0	.0	.0	.0	.0
2	---	---	10.5	9.5	1.0	1.0	.0	.0	.0	.0	.0	.0
3	---	---	11.5	11.0	1.0	1.0	.0	.0	.0	.0	.0	.0
4	---	---	11.5	11.5	1.0	1.0	.0	.0	.0	.0	.0	.0
5	---	---	11.5	10.5	1.0	1.0	.0	.0	.0	.0	.0	.0
6	---	---	11.0	10.5	1.0	.5	.0	.0	.0	.0	.0	.0
7	---	---	11.5	11.0	.5	.5	.0	.0	.0	.0	.0	.0
8	---	---	11.5	11.5	.5	.5	.0	.0	.0	.0	.0	.0
9	---	---	12.5	11.5	.5	.5	.0	.0	.0	.0	.0	.0
10	---	---	12.5	10.0	.5	.5	.0	.0	.0	.0	.0	.0
11	---	---	10.5	8.0	.5	.5	.0	.0	.0	.0	.0	.0
12	---	---	7.5	5.5	.5	.5	.0	.0	.0	.0	.0	.0
13	---	---	5.5	3.5	.5	.5	.0	.0	.0	.0	.0	.0
14	---	---	3.5	3.0	.5	.5	.0	.0	.0	.0	.0	.0
15	---	---	3.5	3.0	.5	.5	.0	.0	.0	.0	.0	.0
16	---	---	5.5	3.5	.5	.0	.0	.0	.0	.0	.0	.0
17	---	---	6.0	5.5	.0	.0	.0	.0	.0	.0	.0	.0
18	---	---	6.0	5.0	1.0	.0	.0	.0	.0	.0	.0	.0
19	---	---	5.5	4.5	1.5	1.0	.0	.0	.0	.0	.0	.0
20	---	---	5.5	4.5	1.5	1.5	.0	.0	.0	.0	.0	.0
21	---	---	5.5	5.0	1.5	.5	.0	.0	.0	.0	.0	.0
22	---	---	5.0	4.0	.5	.5	.0	.0	.0	.0	.0	.0
23	---	---	4.0	3.5	.5	.5	.0	.0	.0	.0	.5	.0
24	---	---	3.5	3.5	.5	.5	.0	.0	.0	.0	1.0	.5
25	10.0	---	3.5	2.0	.0	.0	.0	.0	.0	.0	1.0	.5
26	10.5	10.0	2.0	1.0	.0	.0	.0	.0	.0	.0	.5	.5
27	10.5	10.0	1.0	.5	.0	.0	.0	.0	.0	.0	1.0	.5
28	10.5	10.0	.5	.5	.0	.0	.0	.0	.0	.0	2.0	1.0
29	10.5	9.0	.5	.5	.0	.0	.0	.0	---	---	2.0	2.0
30	9.0	8.0	.5	.5	.0	.0	.0	.0	---	---	---	---
31	9.0	7.5	---	---	.0	.0	.0	.0	---	---	---	---
MONTH			12.5	.5	1.5	.0	.0	.0	.0	.0		

STREAMS TRIBUTARY TO LAKE HURON  
04144000 SHIAWASSEE RIVER AT BYRON, MI--CONTINUED

TEMPERATURE (DEG. C) OF WATER, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DAY	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN
	APRIL		MAY		JUNE		JULY		AUGUST		SEPTEMBER	
1	---	---	---	---	24.5	22.5	20.0	16.5	24.0	21.0	22.5	19.5
2	---	---	---	---	24.0	21.0	16.0	15.0	23.5	21.5	23.0	20.5
3	---	---	---	---	21.0	18.5	14.5	13.5	23.5	22.0	23.5	22.5
4	---	---	---	---	19.0	17.0	16.5	14.5	23.0	20.0	23.0	20.0
5	---	---	---	---	20.0	16.5	18.0	15.0	23.0	20.0	23.5	21.0
6	---	---	---	---	20.0	16.5	20.5	17.0	23.0	20.5	24.0	22.0
7	---	---	---	---	19.5	16.5	21.5	18.5	23.0	21.0	25.0	22.5
8	---	---	---	---	18.5	16.5	21.5	19.0	24.0	21.5	26.0	23.0
9	---	---	---	---	17.5	14.0	21.0	18.0	25.0	23.0	25.0	24.0
10	---	---	---	---	19.0	15.0	21.0	18.0	24.5	22.5	24.5	22.0
11	---	---	---	---	19.5	16.5	19.5	16.0	24.0	22.0	24.5	23.0
12	---	---	---	---	19.5	16.5	20.0	16.0	24.0	22.0	24.5	20.5
13	---	---	---	---	16.5	14.5	19.5	18.0	25.5	22.0	20.5	18.0
14	---	---	---	---	15.0	13.0	21.0	17.5	26.0	23.0	19.0	18.0
15	---	---	---	---	16.0	13.5	21.5	18.5	26.0	24.0	19.5	18.0
16	---	---	---	---	16.0	15.0	22.0	18.5	26.0	24.5	20.0	18.5
17	---	---	---	---	17.5	15.0	22.0	18.0	26.0	22.5	20.0	19.5
18	---	---	---	---	18.5	17.0	22.0	20.0	25.5	24.0	20.0	19.0
19	---	---	---	---	19.5	16.5	22.5	21.0	25.5	23.5	20.0	19.0
20	8.5	---	---	---	20.0	17.0	24.5	21.0	24.0	21.0	22.0	20.0
21	9.5	7.5	---	---	19.5	18.0	25.0	23.5	24.0	20.5	22.0	19.5
22	11.0	7.0	---	---	18.0	16.0	26.0	23.5	24.0	21.0	19.0	17.0
23	11.0	9.0	---	---	17.5	15.0	26.5	23.5	25.0	22.0	17.5	16.0
24	11.0	9.0	---	---	18.0	15.0	24.0	21.5	25.0	23.0	17.0	15.5
25	13.0	9.0	23.0	---	18.0	16.5	24.5	21.5	25.0	23.5	16.5	15.5
26	14.5	10.0	24.0	21.0	17.0	15.5	25.0	23.5	24.0	23.0	16.5	15.0
27	15.5	11.5	25.0	22.5	19.0	16.5	24.5	23.0	23.5	23.0	15.5	14.5
28	16.0	12.5	25.5	22.5	19.5	16.5	24.5	21.0	24.0	23.0	14.5	13.0
29	---	---	26.0	23.0	20.0	18.0	23.5	22.0	24.0	22.0	13.5	12.0
30	---	---	25.0	23.0	20.0	18.5	23.0	20.5	22.5	21.5	12.5	12.0
31	---	---	25.0	22.5	---	---	22.5	20.0	22.5	20.5	---	---
MONTH					24.5	13.0	26.5	13.5	26.0	20.0	26.0	12.0

## STREAMS TRIBUTARY TO LAKE HURON

285

04144500 SHIAWASSEE RIVER AT OWOSSO, MI

LOCATION.--Lat 43°00'54", long 84°10'52", in SW¼ sec.12, T.7 N., R.2 E., Shiawassee County, Hydrologic Unit 04080203, on right bank on grounds of sewage-treatment plant, 1.5 mi (2.4 km) north of Owosso.

DRAINAGE AREA.--538 mi<sup>2</sup> (1,393 km<sup>2</sup>).

PERIOD OF RECORD.--March 1931 to current year. Monthly discharge only for some periods, published in WSP 1307. Gage-height record for flood seasons collected in this vicinity 1904, 1910-30 are contained in reports of U.S. Weather Bureau.

REVISED RECORDS.--WSP 1307: 1949(M). WSP 1337: 1932, 1934, 1936-38, 1944.

GAGE.--Water-stage recorder. Datum of gage is 707.25 ft (215.570 m) National Geodetic Vertical Datum of 1929. Prior to Oct. 15, 1933, at site 1.5 mi (2.4 km) upstream at datum 5.46 ft (1.664 m) higher.

REMARKS.--Records good except those for the winter period, which are fair. Flow regulated below about 800 ft<sup>3</sup>/s (22.7 m<sup>3</sup>/s) by power-plant at Shiawassee town prior to February 1953; occasional regulation at low stages since. Several observations of water temperature were made during the year. National Weather Service gage-height telemark at station.

AVERAGE DISCHARGE.--47 years, 328 ft<sup>3</sup>/s (9.289 m<sup>3</sup>/s), 8.28 in/yr (210 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 6,240 ft<sup>3</sup>/s (177 m<sup>3</sup>/s) Apr. 6, 1947, gage height, 10.35 ft (3.155 m); minimum, 0.2 ft<sup>3</sup>/s (0.006 m<sup>3</sup>/s) July 27, 1934, gage height, 1.12 ft (0.341 m); minimum daily, 2.0 ft<sup>3</sup>/s (0.057 m<sup>3</sup>/s) July 28, 1934.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 2,150 ft<sup>3</sup>/s (60.9 m<sup>3</sup>/s) Mar. 29, gage height, 6.50 ft (1.981 m); maximum gage height, 7.94 ft (2.420 m) Mar. 24, backwater from ice; only peak discharge above base of 1,500 ft<sup>3</sup>/s (42.5 m<sup>3</sup>/s); minimum discharge, 18 ft<sup>3</sup>/s (0.51 m<sup>3</sup>/s) Sept. 10, gage height, 1.77 ft (0.539 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	302	98	279	165	167	165	1680	227	153	112	80	35
2	292	86	291	160	170	165	1410	241	239	113	64	35
3	224	88	248	155	170	160	1270	233	211	106	67	35
4	154	44	332	150	175	160	1240	199	155	96	73	34
5	131	80	249	150	175	160	1200	171	122	91	72	35
6	120	78	244	150	180	160	1130	146	98	85	73	33
7	112	80	207	150	180	160	1120	137	92	80	68	33
8	120	85	197	150	180	160	1040	135	97	66	62	33
9	115	86	148	150	185	160	933	137	101	76	75	41
10	109	98	140	150	185	160	850	142	107	68	54	28
11	114	105	140	150	185	160	776	170	113	57	50	31
12	115	139	140	150	185	160	668	243	120	49	50	37
13	112	176	140	150	185	160	595	326	125	49	47	61
14	110	174	150	150	190	160	538	368	123	54	47	62
15	110	167	160	150	190	170	505	526	125	50	49	35
16	118	173	180	150	190	180	458	612	126	51	62	27
17	126	180	210	150	185	210	396	606	126	50	43	61
18	107	185	230	150	185	240	319	546	122	50	40	81
19	99	182	250	150	185	300	331	421	115	52	69	71
20	94	207	300	150	180	450	329	330	113	54	44	88
21	90	183	350	150	180	600	316	315	122	56	40	113
22	90	151	390	150	180	900	310	287	114	58	40	94
23	83	151	400	150	180	1200	296	262	117	61	37	97
24	95	148	350	150	175	1500	273	343	120	61	36	132
25	125	156	360	150	175	1700	252	385	117	58	34	148
26	146	188	240	150	170	1860	242	352	122	68	34	146
27	153	148	225	155	170	1840	233	274	124	67	46	154
28	151	187	210	155	170	1850	223	208	127	65	45	139
29	151	210	200	160	---	2030	216	177	142	65	38	108
30	146	175	180	160	---	1640	209	162	124	64	36	83
31	129	---	170	165	---	1560	---	138	---	62	35	---
TOTAL	4147	4248	7500	4725	5027	20480	19358	8819	3812	2094	1610	2110
MEAN	134	142	242	152	180	661	645	284	127	67.5	51.9	70.3
MAX	302	210	400	165	190	2030	1680	612	239	113	80	154
MIN	83	78	140	150	167	160	209	135	92	49	34	27
CFSM	.25	.26	.45	.28	.34	1.23	1.20	.53	.24	.13	.10	.13
IN.	.29	.29	.52	.33	.35	1.42	1.34	.61	.26	.14	.11	.15

CAL YR 1977	TOTAL	82427	MEAN 226	MAX 1240	MIN 31	CFSM .42	IN 5.70
WTR YR 1978	TOTAL	83930	MEAN 230	MAX 2030	MIN 27	CFSM .43	IN 5.80



## STREAMS TRIBUTARY TO LAKE HURON

04145000 SHIAWASSEE RIVER NEAR FERGUS, MI

LOCATION.--lat 43°15'17", long 84°06'20", in sec.22, T.10 N., R.3 E., Saginaw County, Hydrologic Unit 04080203, on right bank at downstream side of county highway bridge, 1.2 mi (1.9 km) east of Fergus, 1.8 mi (2.9 km) upstream from Bear Creek, and 14 mi (22 km) above mouth.

DRAINAGE AREA.--637 mi<sup>2</sup> (1,650 km<sup>2</sup>).

PERIOD OF RECORD.--October 1939 to current year. Monthly discharge only for some periods, published in WSP 1307.

REVISED RECORDS.--WSP 1337: 1940(M), 1941-42, 1943(M), 1944, 1945(M), 1946, 1947(M), 1948, 1950. WSP 1627: 1952, 1954(M), 1957.

GAGE.--Water-stage recorder. Datum of gage is 585.80 ft (178.552 m) National Geodetic Vertical Datum of 1929. Prior to Aug. 22, 1968, nonrecording gage at same site and datum. Prior to Oct. 1, 1970, at datum 2.00 ft (0.610 m) higher.

REMARKS.--Records good except those for the winter period, which are fair. Some regulation at low stages by powerplant above Owosso prior to February 1953; occasional regulation at low stages since. Several observations of water temperature were made during the year.

AVERAGE DISCHARGE.--39 years, 418 ft<sup>3</sup>/s (11.84 m<sup>3</sup>/s), 8.91 in/yr (226 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 7,500 ft<sup>3</sup>/s (212 m<sup>3</sup>/s) Apr. 6, 1947 (includes overflow bypassing gage); maximum gage height, 15.44 ft (4.706 m), present datum, Mar. 29, 1960; minimum discharge, 27 ft<sup>3</sup>/s (0.76 m<sup>3</sup>/s) Aug. 8, 1966; minimum gage height, 1.60 ft (0.488 m) July 25, 26, 1978.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 2,730 ft<sup>3</sup>/s (77.3 m<sup>3</sup>/s) Apr. 1, gage height, 9.37 ft (2.856 m); maximum gage height, 13.08 ft (3.987 m), occurred sometime during period Mar. 23-30, from recorded range in stage, backwater from ice; minimum discharge, 48 ft<sup>3</sup>/s (1.36 m<sup>3</sup>/s) July 25, 26, gage height, 1.60 ft (0.488 m).

DISCHARGE IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	266	165	326	240	171	200	2670	243	164	100	50	50
2	362	140	396	230	175	195	2110	252	173	109	50	50
3	321	128	357	225	180	195	1720	259	227	108	66	50
4	246	120	394	224	190	195	1760	257	201	98	58	49
5	191	131	471	220	195	190	1590	236	168	92	64	49
6	172	126	400	220	200	190	1440	216	139	88	65	49
7	155	126	300	215	200	185	1450	195	117	82	65	49
8	145	126	250	210	205	185	1300	189	122	84	63	49
9	152	126	210	200	210	185	1130	185	118	77	67	49
10	147	126	180	195	215	185	990	184	113	74	79	49
11	140	132	170	190	215	185	926	182	113	76	69	49
12	140	143	170	190	220	185	830	222	125	68	61	49
13	143	170	170	185	220	185	704	280	133	63	59	55
14	143	198	170	180	225	190	633	351	128	61	59	64
15	140	201	180	180	225	195	584	389	125	59	57	81
16	139	203	200	175	225	210	539	520	125	58	57	77
17	139	204	220	175	225	220	493	562	133	55	73	57
18	140	209	250	170	220	250	429	545	133	53	66	71
19	130	212	280	170	220	290	367	482	121	56	68	94
20	120	225	300	170	220	350	374	369	114	54	95	97
21	118	250	350	170	220	500	372	351	114	52	80	113
22	116	227	400	170	220	700	348	324	114	52	65	128
23	115	208	450	170	215	1000	341	292	106	52	60	113
24	114	206	470	170	215	1500	330	280	104	50	55	110
25	118	206	450	175	210	1900	307	355	105	49	52	135
26	149	212	400	170	210	2100	286	357	110	49	50	150
27	164	300	330	170	205	2200	274	326	108	56	56	155
28	170	276	300	170	200	2200	265	259	105	60	54	165
29	173	302	280	170	---	2200	253	219	105	54	52	155
30	173	274	260	170	---	2200	250	195	118	52	50	133
31	173	---	250	170	---	2310	---	186	---	52	50	---
TOTAL	5114	5681	9334	5839	5851	22975	25065	9262	3881	2093	1915	2544
MEAN	165	189	301	188	209	741	836	299	129	67.5	61.8	84.8
MAX	362	302	471	240	225	2310	2670	562	227	109	95	165
MIN	114	126	170	170	171	185	250	182	104	49	50	49
CFSM	.26	.30	.47	.30	.33	1.16	1.31	.47	.20	.11	.10	.13
IN.	.30	.33	.55	.34	.34	1.34	1.46	.54	.23	.12	.11	.15
CAL YR 1977 TOTAL	90828		MEAN 249	MAX 1230	MIN 52	CFSM .39	IN 5.30					
WTR YR 1978 TOTAL	99554		MEAN 273	MAX 2670	MIN 49	CFSM .43	IN 5.81					

## STREAMS TRIBUTARY TO LAKE HURON

287

04146000 FARMERS CREEK NEAR LAPEER, MI

LOCATION.--Lat 43°02'41", long 83°20'14", in sec.6, T.7 N., R.10 E., Lapeer County, Hydrologic Unit 04080204, on left bank at sewage-treatment plant at Michigan Home and Training School, 2.0 mi (3.2 km) west of Lapeer.

DRAINAGE AREA.--55.3 mi<sup>2</sup> (143.2 km<sup>2</sup>), revised.

PERIOD OF RECORD.--October 1932 to current year. Monthly discharge only for some periods, published in WSP 1307.

REVISED RECORDS.--WSP 924: 1940. WSP 1084: 1942(M), 1943. WSP 1337: 1934-38, 1940(M), 1944(M), 1945, 1946(M), 1948-51(M).  
WSP 1727: 1952(M). WRD MI-71: Drainage area.

GAGE.--Water-stage recorder and concrete control. Datum of gage is 805.79 ft (245.605 m) National Geodetic Vertical Datum of 1929. Prior to May 25, 1954, nonrecording gage at same site and datum.

REMARKS.--Records good except those for the winter period, which are fair. Prior to 1941, occasional regulation by dam above station. Several observations of water temperature were made during the year.

AVERAGE DISCHARGE.--46 years, 30.0 ft<sup>3</sup>/s (0.850 m<sup>3</sup>/s), 7.37 in/yr (187 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,280 ft<sup>3</sup>/s (36.2 m<sup>3</sup>/s) Apr. 6, 1947, gage height, 19.87 ft (6.056 m), from flood-mark, from rating curve extended above 660 ft<sup>3</sup>/s (18.7 m<sup>3</sup>/s) on basis of contracted-opening measurement of peak flow; minimum not determined.

EXTREMES FOR CURRENT YEAR.--Peak discharges above base of 160 ft<sup>3</sup>/s (4.53 m<sup>3</sup>/s) and maximum (\*):

Date	Time	Discharge (ft <sup>3</sup> /s) (m <sup>3</sup> /s)	Gage height (ft) (m)	Date	Time	Discharge (ft <sup>3</sup> /s) (m <sup>3</sup> /s)	Gage height (ft) (m)
Mar. 25	1030	ice jam	*17.53 5.343	Apr. 4	1500	177 5.01	16.75 5.105
Mar. 25	2300	*273 7.73	17.21 5.246				

Minimum discharge, 1.1 ft<sup>3</sup>/s (0.031 m<sup>3</sup>/s) Sept. 6, 7, 8, 9-11, 12; minimum gage height, 14.96 ft (4.560 m) Sept. 11, 12.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	18	11	31	25	19	15	141	26	9.7	6.9	2.5	1.4
2	19	11	31	23	19	15	147	24	10	7.9	2.7	1.4
3	26	11	33	22	20	15	163	22	9.3	7.9	3.5	1.3
4	33	11	30	21	20	15	174	21	9.6	7.9	3.5	1.2
5	36	11	40	19	20	16	165	20	8.6	7.9	3.3	1.3
6	36	16	34	18	21	17	160	20	8.6	7.6	3.1	1.2
7	33	18	30	17	21	18	160	12	8.3	7.6	2.9	1.2
8	29	27	27	15	21	18	153	10	9.0	6.9	2.9	1.1
9	26	34	26	13	21	18	139	12	10	6.5	2.9	1.1
10	26	39	26	14	21	19	121	17	9.3	5.9	2.7	1.1
11	25	36	26	15	21	20	109	19	9.0	5.3	2.5	1.1
12	23	33	26	16	21	21	97	23	9.0	4.7	2.5	1.2
13	22	29	25	16	21	22	86	26	10	4.4	2.5	1.5
14	22	26	25	16	21	24	82	28	11	4.4	2.3	2.3
15	22	25	25	16	21	25	79	27	11	4.1	2.1	2.5
16	22	24	25	16	21	27	70	32	11	3.8	2.1	2.9
17	21	22	24	16	21	30	64	38	11	3.5	2.5	3.1
18	20	22	24	16	20	34	59	42	11	3.5	1.9	5.0
19	20	22	24	16	20	39	55	42	10	3.3	2.1	5.9
20	19	25	24	16	20	46	53	41	10	3.3	2.7	6.5
21	18	35	25	16	19	56	49	42	11	3.5	2.5	7.9
22	16	40	26	16	18	90	48	37	11	3.8	2.5	8.6
23	15	37	28	15	18	140	46	34	10	4.1	2.3	8.6
24	14	38	29	16	17	180	45	31	9.7	3.9	2.1	8.6
25	13	34	29	16	17	260	44	23	9.0	3.5	1.9	8.6
26	12	30	29	16	16	254	40	12	8.6	3.5	1.7	8.3
27	12	25	29	16	16	208	36	10	8.6	3.5	1.7	8.3
28	12	25	29	17	15	177	33	9.3	8.3	3.3	1.9	8.6
29	12	24	28	17	---	157	31	9.3	7.9	3.1	1.9	9.7
30	12	22	27	18	---	147	28	9.3	7.6	2.9	1.7	11
31	11	---	25	18	---	144	---	9.7	---	2.7	1.5	---
TOTAL	645	763	860	527	546	2267	2682	728.6	286.1	151.0	74.9	132.5
MEAN	20.8	25.4	27.7	17.0	19.5	73.1	99.4	23.5	9.54	4.87	2.42	4.42
MAX	36	40	40	25	21	260	174	42	11	7.9	3.5	11
MIN	11	11	24	13	15	15	28	9.3	7.6	2.7	1.5	1.1
CFSM	.38	.46	.50	.31	.35	1.32	1.62	.43	.17	.09	.04	.08
IN.	.43	.51	.58	.35	.37	1.52	1.80	.49	.19	.10	.05	.09

CAL YR 1977	TOTAL	7311.50	MEAN 20.0	MAX 78	MIN .90	CFSM .36	IN 4.92
WTR YR 1978	TOTAL	9663.10	MEAN 26.5	MAX 260	MIN 1.1	CFSM .48	IN 6.50

## STREAMS TRIBUTARY TO LAKE HURON

## 04147000 HOLLOWAY RESERVOIR NEAR OTISVILLE, MI

LOCATION.--Lat 43°07'15", long 83°29'45", in NW¼ sec.11, T.8 N., R.8 E., Genesee County, Hydrologic Unit 04080204, in gatehouse on right side of Holloway Dam on Flint River, 3.5 mi (5.6 km) southeast of Otisville.

DRAINAGE AREA.--526 mi<sup>2</sup> (1,362 km<sup>2</sup>).

PERIOD OF RECORD.--March 1954 to current year.

REVISED RECORDS.--WSP 2111: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is National Geodetic Vertical Datum of 1929 (levels by city of Flint).

REMARKS.--Reservoir is formed by an earth-fill dam with concrete spillway completed in 1953. Capacity of reservoir, 1,256,000,000 cu ft (35.6 hm<sup>3</sup>) at elevation 760.00 ft (231.65 m). The spillway section includes two 90 foot (27.4 m) drum gates with minimum crest elevation of 751 ft (228.9 m), maximum at 755 ft (230.1 m), three 20-foot (6.1 m) radial gates with sill elevation of 745 ft (227.1 m), and 2 sluices (each 4 by 6 ft), one on each side with valve controls. Entrance elevation of sluiceways is 724 ft (220.7 m). Reservoir is used to regulate flow for sewage dilution for city of Flint.

COOPERATION.--Reservoir elevations furnished by city of Flint.

EXTREMES FOR PERIOD OF RECORD.--Maximum contents, 996,000,000 cu ft (28.2 hm<sup>3</sup>) Mar. 8, 1956, elevation, 757.4 ft (230.86 m); minimum, reservoir empty at times during October, November, 1954, January, February, 1955, October, 1971.

EXTREMES FOR CURRENT YEAR.--Maximum contents, 802,000,000 cu ft (22.7 hm<sup>3</sup>) Oct. 6-8, elevation, 755.35 ft (230.23 m); minimum, 326,000,000 cu ft (9.23 hm<sup>3</sup>) Sept. 30, elevation, 748.42 ft (228.12 m).

## MONTHEND ELEVATION AND CONTENTS AT 2400, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

Date	Elevation (feet)	Contents (millions of cubic feet)	Change in contents during month	
			Millions of cubic feet	Equivalent in ft <sup>3</sup> /s
Sept. 30 . . . . .	753.78	669	--	--
Oct. 31 . . . . .	753.79	670	+1	+0.4
Nov. 30 . . . . .	752.26	555	-115	-44.4
Dec. 31 . . . . .	751.40	497	-58	-21.7
CAL YR 1977 . . . . .	--	--	+7	+0.2
Jan. 31 . . . . .	751.22	486	-11	-4.1
Feb. 28 . . . . .	751.19	484	-2	-0.8
Mar. 31 . . . . .	753.58	653	+169	+63.1
Apr. 30 . . . . .	752.48	571	-82	-31.6
May 31 . . . . .	755.03	773	+202	+75.4
June 30 . . . . .	755.04	774	+1	+0.4
July 31 . . . . .	752.62	580	-194	-72.4
Aug. 31 . . . . .	751.97	535	-45	-16.8
Sept. 30 . . . . .	748.42	326	-209	-80.6
WTR YR 1978 . . . . .	--	--	-343	-10.9

## STREAMS TRIBUTARY TO LAKE HURON

289

## 04147500 FLINT RIVER NEAR OTISVILLE, MI

LOCATION.--Lat 43°06'40", long 83°31'10", in SE¼ sec.9, T.8 N., R.8 E., Genesee County, Hydrologic Unit 04080204, on left bank 20 ft (6 m) downstream from bridge on State Highway 15, 1.5 mi (2.4 km) downstream from Holloway Reservoir, 3.5 mi (5.6 km) upstream from Powers-Cullen drain, and 3.8 mi (6.1 km) south of Otisville.

DRAINAGE AREA.--530 mi<sup>2</sup> (1,373 km<sup>2</sup>), revised.

PERIOD OF RECORD.--October 1952 to current year.

REVISED RECORDS.--WSP 2111: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 721.39 ft (219.880 m) National Geodetic Vertical Datum of 1929.

REMARKS.--Records good. Flow regulated by Holloway Reservoir, 1.5 mi (2.4 km) above station (see preceding page). Several observations of water temperature were made during the year. City of Flint gage-height telemark at station.

AVERAGE DISCHARGE.--26 years, 294 ft<sup>3</sup>/s (8.326 m<sup>3</sup>/s), 7.53 in/yr (191 mm/yr), adjusted for storage since 1954.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 6,150 ft<sup>3</sup>/s (174 m<sup>3</sup>/s) Apr. 1, 1960, gage height, 14.97 ft (4.563 m); minimum, 2.1 ft<sup>3</sup>/s (0.059 m<sup>3</sup>/s) Oct. 11, 12, 1971, gage height, 1.57 ft (0.479 m).

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 2,700 ft<sup>3</sup>/s (76.5 m<sup>3</sup>/s) Mar. 27, gage height, 12.24 ft (3.731 m); minimum, 12 ft<sup>3</sup>/s (0.34 m<sup>3</sup>/s) Aug. 3, 4, gage height, 1.91 ft (0.582 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	384	260	329	265	200	166	2120	16	205	147	193	43
2	374	260	349	235	205	165	2180	16	184	146	183	44
3	389	259	513	212	201	164	2150	17	178	134	76	168
4	397	283	509	198	197	170	2120	18	162	113	86	535
5	423	336	509	190	205	166	2180	17	161	14	136	310
6	441	336	509	185	214	224	2180	16	147	14	136	276
7	439	333	509	184	208	253	2120	18	142	55	136	222
8	423	331	509	190	204	212	1970	18	146	120	136	213
9	382	329	505	193	198	210	1740	17	139	120	64	199
10	360	331	505	174	193	259	1520	35	129	133	23	198
11	333	329	501	168	188	312	1340	100	123	154	23	198
12	389	328	569	162	191	310	967	261	130	130	24	198
13	407	328	471	165	193	363	663	396	130	64	24	196
14	357	328	202	164	187	644	835	254	130	14	25	195
15	328	328	66	160	187	645	907	367	132	13	25	169
16	315	328	144	159	187	445	787	407	131	14	25	141
17	299	326	222	159	184	299	701	414	128	71	25	176
18	289	325	304	156	181	392	635	425	127	221	25	156
19	282	323	399	156	178	401	509	396	128	299	26	160
20	276	325	513	158	176	447	387	380	119	289	26	99
21	271	325	591	159	172	533	390	385	124	255	29	100
22	271	323	633	158	170	541	390	335	119	167	35	100
23	271	325	643	156	170	679	390	340	122	94	35	100
24	270	325	645	156	168	1160	387	333	116	158	44	100
25	268	325	621	160	168	1860	384	315	108	137	47	139
26	266	325	667	195	164	2510	297	289	103	138	41	167
27	266	323	541	198	164	2680	16	257	100	138	41	167
28	265	323	395	187	165	2470	16	223	99	137	41	166
29	264	323	369	186	---	2260	16	198	124	139	41	165
30	262	323	337	188	---	2130	16	193	160	139	42	159
31	260	---	288	197	---	2140	---	217	---	159	42	---
TOTAL	10221	9566	13907	5573	5218	25355	30313	6673	4046	3926	1855	5199
MEAN	330	319	449	180	186	818	1010	215	135	127	59.8	173
MAX	441	336	667	265	214	2680	2180	425	205	299	193	535
MIN	260	259	66	156	164	164	16	16	99	13	23	43
MEAN+	330	275	427	176	185	881	978	290	135	54.6	43.0	92.4
CFSM+	.62	.52	.81	.33	.35	1.66	1.85	.55	.26	.10	.08	.17
IN+	.72	.58	.93	.38	.36	1.92	2.06	.63	.29	.12	.09	.19

CAL YR 1977 TOTAL 84830.8 MEAN 232 MAX 983 MTN 9.2 MEAN+ 232 CFSM+ .44 IN+ 5.95  
WTR YR 1978 TOTAL 121852.0 MEAN 334 MAX 2680 MTN 13 MEAN+ 323 CFSM+ .61 IN+ 8.28

\*Adjusted for change in contents in Holloway Reservoir.

## STREAMS TRIBUTARY TO LAKE HURON

04147990 BUTTERNUT CREEK NEAR GENESEE, MI

LOCATION.--Lat 43°08'09", long 83°35'57", in NE $\frac{1}{4}$  NE $\frac{1}{4}$  sec.2, T.8 N., R.7 E., Genesee County, Hydrologic Unit 04080204, on right bank 10 ft (3 m) downstream from bridge on Frances Road, 2.3 mi (3.7 km) upstream from mouth, and 2.0 mi (3.2 km) northeast of Genesee.

DRAINAGE AREA.--34.7 mi<sup>2</sup> (89.9 km<sup>2</sup>), revised.

PERIOD OF RECORD.--January 1970 to current year.

GAGE.--Water-stage recorder. Altitude of gage is 730 ft (223 m) from topographic map (nearest 10 ft). Prior to June 11, 1970, non-recording gage at same site and datum.

REMARKS.--Records good except those for the winter period, which are fair. Several observations of water temperature were made during the year.

AVERAGE DISCHARGE.--8 years, 22.4 ft<sup>3</sup>/s (0.634 m<sup>3</sup>/s), 8.77 in/yr (223 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 533 ft<sup>3</sup>/s (15.1 m<sup>3</sup>/s) May 17, 1974, gage height, 8.21 ft (2.502 m); maximum gage height, 8.68 ft (2.646 m) Dec. 31, 1972; minimum discharge, 1.2 ft<sup>3</sup>/s (0.034 m<sup>3</sup>/s) Dec. 1, 1971, result of freezeup; minimum gage height, 1.48 ft (0.451 m) July 23, 27, 28, 1977.

EXTREMES FOR CURRENT YEAR.--Peak discharges above base of 200 ft<sup>3</sup>/s (5.66 m<sup>3</sup>/s) and maximum (\*):

Date	Time	Discharge (ft <sup>3</sup> /s) (m <sup>3</sup> /s)	Gage height (ft) (m)	Date	Time	Discharge (ft <sup>3</sup> /s) (m <sup>3</sup> /s)	Gage height (ft) (m)
Mar. 23	2100	*382 10.8	*8.24 2.512	Mar. 31	2400	223 6.32	6.94 2.115
Mar. 28	2200	288 8.16	7.66 2.335	Apr. 4	1900	240 6.80	7.26 2.213

Minimum discharge, 1.4 ft<sup>3</sup>/s (0.040 m<sup>3</sup>/s) Sept. 27; minimum gage height, 1.50 ft (0.457 m) Sept. 6, 11.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	46	5.0	74	11	11	9.2	198	13	9.6	3.2	2.1	1.8
2	34	5.2	46	11	11	9.4	124	12	10	3.4	2.0	1.8
3	19	5.2	25	10	11	9.7	118	10	8.5	3.3	2.1	1.8
4	14	5.0	20	9.5	11	10	183	9.6	7.1	3.1	2.0	1.8
5	11	4.7	17	8.5	10	10	157	11	6.6	3.0	1.9	1.8
6	8.5	5.0	14	8.0	10	11	121	12	6.0	2.9	1.9	1.8
7	7.1	6.3	14	7.5	10	11	118	12	5.7	2.8	1.9	1.7
8	12	6.8	13	7.5	9.8	11	93	12	6.0	2.8	1.9	1.8
9	24	6.6	13	7.5	9.6	12	77	16	6.3	2.8	2.1	1.8
10	14	21	13	8.0	9.5	12	64	16	5.3	2.7	2.0	1.8
11	11	15	12	8.0	9.2	13	54	15	4.6	2.7	1.9	1.7
12	13	12	12	8.0	9.0	13	49	20	4.7	2.6	1.9	1.9
13	12	9.8	13	8.0	8.8	14	44	36	4.7	2.7	1.9	2.2
14	10	8.5	15	8.0	8.5	15	39	42	4.4	2.8	1.8	2.6
15	9.4	8.3	17	8.0	8.4	16	37	38	4.4	2.7	1.8	2.8
16	15	12	20	8.0	8.4	18	31	33	4.4	2.6	1.9	2.5
17	13	13	22	8.0	8.4	21	32	27	5.0	2.6	1.9	3.3
18	11	10	25	8.0	8.4	27	29	23	5.4	2.5	1.9	5.2
19	9.8	8.5	28	8.0	8.4	39	29	20	4.9	2.5	2.2	4.6
20	8.7	21	23	8.2	8.4	85	29	18	5.7	2.5	2.2	3.3
21	7.8	27	19	8.4	8.4	227	27	19	6.0	2.7	2.0	2.5
22	7.1	16	17	8.6	8.4	257	25	16	4.9	2.8	2.0	2.4
23	6.5	13	15	8.8	8.4	304	23	14	4.1	2.7	1.8	2.2
24	6.2	19	14	9.0	8.4	298	23	12	3.9	2.6	1.8	1.8
25	5.9	17	14	9.2	8.6	219	22	11	3.6	2.5	1.9	1.6
26	7.0	15	14	9.6	8.7	194	19	9.2	3.8	2.4	1.9	1.5
27	6.8	14	14	10	8.8	145	18	8.1	3.5	2.3	2.0	1.5
28	5.4	11	13	10	9.0	176	16	7.1	3.3	2.2	2.0	1.7
29	5.2	8.5	13	11	---	189	16	6.3	3.2	2.2	2.0	1.5
30	4.9	12	12	11	---	134	15	6.3	3.1	2.1	1.9	1.5
31	4.7	---	12	11	---	163	---	8.7	---	2.1	1.8	---
TOTAL	370.0	341.4	593	275.3	257.5	2672.3	1830	513.3	158.7	82.8	60.4	66.2
MEAN	11.9	11.4	19.1	8.88	9.20	86.2	61.0	16.6	5.29	2.67	1.95	2.21
MAX	46	27	74	11	11	304	198	42	10	3.4	2.2	5.2
MIN	4.7	4.7	12	7.5	8.4	9.2	15	6.3	3.1	2.1	1.8	1.5
CFSM	.34	.33	.55	.26	.27	2.48	1.76	.48	.15	.08	.06	.06
IN.	.40	.37	.54	.30	.28	2.86	1.96	.55	.17	.09	.06	.07

CAL YR 1977	TOTAL	3874.9	MEAN 10.6	MAX 110	MIN 2.0	CFSM .31	IN 4.15
WTR YR 1978	TOTAL	7220.9	MEAN 19.8	MAX 304	MIN 1.5	CFSM .57	IN 7.74



## STREAMS TRIBUTARY TO LAKE HURON

291

04148140 KEARSLEY CREEK NEAR DAVISON, MI

LOCATION.--Lat 43°02'01", long 83°34'53", in NE¼ sec.12, T.7 N., R.7 E., Genesee County, Hydrologic Unit 04080204, on right bank 10 ft (3 m) upstream from bridge on State Highway 21, 1.4 mi (2.3 km) downstream from Black Creek, and 3.3 mi (5.3 km) west of Davison.

DRAINAGE AREA.--99.4 mi<sup>2</sup> (257.4 km<sup>2</sup>), revised.

PERIOD OF RECORD.--October 1965 to current year.

REVISED RECORDS.--WSP 2111: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 747.39 ft (227.804 m) National Geodetic Vertical Datum of 1929.

REMARKS.--Records good except those for the winter period, which are fair. Some diurnal fluctuation caused by small dams, and occasional diversion for sprinkler irrigation above station. Several observations of water temperature were made during the year. Gage-height telemark at station.

AVERAGE DISCHARGE.--13 years, 70.4 ft<sup>3</sup>/s (1.994 m<sup>3</sup>/s), 9.62 in/yr (244 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,430 ft<sup>3</sup>/s (40.5 m<sup>3</sup>/s) Apr. 21, 1975, gage height, 11.32 ft (3.450 m); minimum, 2.5 ft<sup>3</sup>/s (0.071 m<sup>3</sup>/s) Sept. 10, 1978; minimum gage height, 2.69 ft (0.820 m) Sept. 12, 1969.

EXTREMES FOR CURRENT YEAR.--Peak discharges above base of 350 ft<sup>3</sup>/s (9.91 m<sup>3</sup>/s) and maximum (\*):

Date	Time	Discharge (ft <sup>3</sup> /s) (m <sup>3</sup> /s)	Gage height (ft) (m)	Date	Time	Discharge (ft <sup>3</sup> /s) (m <sup>3</sup> /s)	Gage height (ft) (m)
Mar. 24	0100	*708 20.1	*9.75 2.972	Apr. 5	0100	457 12.9	8.46 2.579

Minimum discharge, 2.5 ft<sup>3</sup>/s (0.071 m<sup>3</sup>/s) Sept. 10; minimum gage height, 2.74 ft (0.835 m) July 16.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	50	18	90	37	37	31	289	41	36	14	5.4	5.4
2	38	18	40	35	38	31	251	39	27	15	5.8	5.2
3	38	18	70	33	38	31	278	37	24	15	13	4.1
4	40	19	60	31	38	32	395	35	23	15	8.3	4.0
5	35	20	60	30	38	32	419	36	23	14	8.9	3.9
6	30	41	50	29	38	33	346	37	23	13	8.2	3.5
7	25	37	46	28	38	35	316	36	24	11	7.6	3.3
8	25	37	45	27	38	37	228	38	24	10	6.6	3.3
9	23	39	43	27	38	38	197	42	22	9.0	8.3	3.1
10	23	56	42	26	38	40	168	43	23	8.4	6.9	3.1
11	28	48	41	26	38	42	150	44	22	14	5.8	3.4
12	29	46	40	26	38	45	131	55	26	11	5.4	4.1
13	27	44	40	25	37	50	119	104	24	7.7	4.8	7.9
14	26	41	42	25	37	55	106	84	23	6.3	4.6	14
15	25	38	42	25	36	60	93	88	25	4.7	4.0	11
16	28	38	40	25	36	70	82	102	24	4.6	7.4	7.3
17	25	37	39	25	35	80	76	113	21	4.5	5.6	17
18	26	37	38	26	34	100	91	99	20	4.4	4.8	23
19	26	37	37	26	34	150	88	79	17	5.0	11	17
20	24	40	37	27	33	250	68	70	15	5.0	8.3	11
21	23	50	40	27	33	380	65	58	20	5.8	7.6	17
22	22	55	43	28	33	529	61	54	16	6.4	8.9	12
23	20	60	45	28	32	617	45	53	17	6.8	7.9	8.8
24	19	50	46	29	32	644	51	54	15	7.1	7.0	7.7
25	19	45	46	30	32	530	62	47	13	6.9	6.6	6.8
26	18	42	46	31	31	501	74	40	14	10	5.6	6.4
27	18	40	45	31	31	472	66	37	12	11	5.9	6.5
28	17	40	45	32	31	406	56	33	12	6.4	7.2	7.1
29	17	40	44	34	---	378	46	30	11	6.0	6.7	6.4
30	18	40	42	35	---	312	43	37	10	6.0	6.3	6.2
31	18	---	40	36	---	277	---	51	---	5.5	5.5	---
TOTAL	800	1171	1464	900	992	6288	4450	1716	606	269.5	215.9	239.5
MEAN	25.8	39.0	47.2	29.0	35.4	203	148	55.4	20.2	8.69	6.96	7.98
MAX	50	60	90	37	38	644	419	113	36	15	13	23
MIN	17	18	37	25	31	31	43	30	10	4.4	4.0	3.1
CFSM	.26	.39	.48	.29	.36	2.04	1.49	.56	.20	.09	.07	.08
IN.	.30	.44	.55	.34	.37	2.35	1.67	.64	.23	.10	.08	.09

CAL YR 1977	TOTAL	14094.6	MEAN	38.6	MAX	249	MIN	4.2	CFSM	.39	IN	5.27
WTR YR 1978	TOTAL	19111.9	MEAN	52.4	MAX	644	MIN	3.1	CFSM	.53	IN	7.15

STREAMS TRIBUTARY TO LAKE HURON  
04148160 GILKEY CREEK NEAR FLINT, MI

LOCATION.--Lat 43°01'27", long 83°37'32", in NE¼ SW¼ sec.10, T.7 N., R.7 E., Genesee County, Hydrologic Unit 04080204, on right bank 25 ft (8 m) downstream from culvert on extension of Arapaho Street, 5.1 mi (8.2 km) upstream from mouth, and 3.5 mi (5.6 km) east of Flint.

DRAINAGE AREA.--6.43 mi<sup>2</sup> (16.65 km<sup>2</sup>), revised.

PERIOD OF RECORD.--January 1970 to current year.

GAGE.--Water-stage recorder. Datum of gage is 747.56 ft (227.856 m) National Geodetic Vertical Datum of 1929.

REMARKS.--Records fair except those for the winter period and those below 1.0 ft<sup>3</sup>/s (0.028 m<sup>3</sup>/s), which are poor. Several observations of water temperature were made during the year.

AVERAGE DISCHARGE.--8 years, 4.92 ft<sup>3</sup>/s (0.139 m<sup>3</sup>/s), 10.39 in/yr (264 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 285 ft<sup>3</sup>/s (8.07 m<sup>3</sup>/s) Apr. 19, 1975, gage height, 7.66 ft (2.335 m); no flow on many days during 1970, 1973, 1974, 1975, 1976, 1977, and 1978.

EXTREMES FOR CURRENT YEAR.--Peak discharges above base of 80 ft<sup>3</sup>/s (2.27 m<sup>3</sup>/s) and maximum (\*):

Date	Time	Discharge (ft <sup>3</sup> /s) (m <sup>3</sup> /s)	Gage height (ft) (m)	Date	Time	Discharge (ft <sup>3</sup> /s) (m <sup>3</sup> /s)	Gage height (ft) (m)
Mar. 21	0800	ice jam	*4.59 1.399	Mar. 22	2000	99 2.80	3.91 1.192
Mar. 21	1500	*124 3.51	4.53 1.381	Mar. 23	2000	88 2.49	3.63 1.106

No flow on many days during year.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	15	.03	2.5	1.0	.50	.42	14	1.1	1.1	.24	.03	.00
2	2.5	.33	2.0	1.0	.50	.42	5.1	1.1	.96	1.4	.08	.00
3	.96	.41	1.5	1.0	.45	.42	11	1.1	.92	.56	1.6	.00
4	.65	.35	1.2	1.0	.45	.42	31	1.1	.88	.06	.08	.00
5	.30	.32	1.1	1.0	.45	.42	23	1.3	.96	.03	.03	.00
6	.18	7.1	1.1	1.0	.45	.42	11	1.2	.98	.02	.01	.00
7	.12	1.8	.95	1.0	.45	.42	8.7	1.1	.84	.01	.00	.00
8	.53	1.1	.85	1.0	.45	.42	4.9	1.3	1.2	.01	.00	.00
9	1.1	.96	.80	1.0	.45	.42	5.1	1.4	.88	.00	.18	.00
10	.77	5.3	.85	.90	.45	.45	4.9	1.2	.80	.00	.12	.00
11	.88	1.5	.85	.85	.44	.47	4.9	1.1	.68	.00	.03	.00
12	2.4	1.0	.85	.80	.43	.50	4.2	2.4	1.7	.00	.01	.00
13	1.1	.88	.90	.75	.42	.60	3.6	5.3	1.6	.00	.01	.43
14	.77	.80	1.0	.70	.42	.70	3.0	3.5	.92	.00	.00	4.7
15	.53	.96	1.3	.70	.42	.80	2.7	2.5	.71	.00	.00	2.7
16	2.2	1.3	1.7	.65	.42	1.0	2.5	1.8	.62	.00	.62	.11
17	1.1	1.2	3.0	.65	.42	2.0	2.4	1.6	.92	.00	.14	2.1
18	.88	.96	8.0	.65	.42	5.0	2.4	1.5	.56	.00	.03	7.1
19	.84	.84	7.0	.65	.42	12	2.4	1.3	.23	.00	.74	2.0
20	.80	2.2	6.0	.60	.42	32	2.4	2.5	.07	.00	.26	.41
21	.68	3.2	4.5	.60	.42	110	2.2	1.8	1.3	.00	.03	3.3
22	.53	1.3	3.5	.60	.42	74	1.8	1.3	.56	.01	.01	1.1
23	.37	1.2	2.7	.60	.42	70	1.5	1.2	.10	.02	.00	.14
24	.24	1.1	2.5	.55	.42	40	1.7	1.1	.04	.02	.00	.02
25	.14	.90	2.8	.55	.42	15	1.3	1.1	.03	.02	.00	.01
26	.10	.70	1.8	.55	.42	16	1.3	1.1	.11	.04	.00	.02
27	.06	.55	1.4	.50	.42	18	1.2	1.0	.53	.37	.04	.05
28	.03	.40	1.3	.50	.42	23	1.2	1.0	.05	.05	.04	.11
29	.02	.30	1.2	.50	---	19	1.2	.96	.03	.04	.02	.04
30	.02	.23	1.1	.50	---	9.3	1.1	1.7	.03	.03	.01	.04
31	.02	---	1.0	.50	---	13	---	1.7	---	.02	.00	---
TOTAL	35.82	39.22	67.25	22.85	12.19	466.60	163.7	49.36	20.21	2.95	4.12	24.38
MEAN	1.16	1.31	2.17	.74	.44	15.1	5.46	1.59	.67	.095	.13	.81
MAX	15	7.1	8.0	1.0	.50	110	31	5.3	1.7	1.4	1.6	7.1
MIN	.02	.03	.80	.50	.42	.42	1.1	.96	.03	.00	.00	.00
CFSM	.18	.20	.34	.12	.07	2.35	.85	.25	.10	.02	.02	.13
IN.	.21	.23	.39	.13	.07	2.70	.95	.29	.12	.02	.02	.14

CAL YR 1977 TOTAL 742.00 MEAN 2.03 MAX 42 MIN .00 CFSM .32 IN 4.29  
WTR YR 1978 TOTAL 908.65 MEAN 2.49 MAX 110 MIN .00 CFSM .39 IN 5.26

## STREAMS TRIBUTARY TO LAKE HURON

293

04148300 SWARTZ CREEK AT FLINT, MI

LOCATION.--Lat 42°59'16", long 83°43'57", in NW¼ sec.26, T.7 N., R.6 E., Genesee County, Hydrologic Unit 04080204, on right bank 6 ft (2 m) downstream from bridge on South Ballenger Highway, in Flint, 3.6 mi (5.8 km) upstream from mouth.

DRAINAGE AREA.--115 mi<sup>2</sup> (298 km<sup>2</sup>).

PERIOD OF RECORD.--January 1970 to current year.

REVISED RECORDS.--MOR MI-75: 1971-73.

GAGE.--Water-stage recorder. Datum of gage is 727.05 ft (221.605 m) National Geodetic Vertical Datum of 1929. Prior to Sept. 4, 1970, nonrecording gage at same site and datum.

REMARKS.--Records good except those for the winter period, which are fair. Several observations of water temperature were made during the year. Gage-height telemark at station.

AVERAGE DISCHARGE.--8 years, 84.5 ft<sup>3</sup>/s (2.393 m<sup>3</sup>/s), 9.98 in/yr (253 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 3,160 ft<sup>3</sup>/s (89.5 m<sup>3</sup>/s) Apr. 19, 1975, gage height, 9.02 ft (2.749 m); minimum, 0.01 ft<sup>3</sup>/s (<0.001 m<sup>3</sup>/s) Sept. 9, 1978; minimum gage height, 1.16 ft (0.354 m) Aug. 19, 1971.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 1,230 ft<sup>3</sup>/s (34.8 m<sup>3</sup>/s) Mar. 23, gage height, 7.14 ft (2.176 m), only peak above base of 800 ft<sup>3</sup>/s (22.7 m<sup>3</sup>/s); minimum, 0.01 ft<sup>3</sup>/s (<0.001 m<sup>3</sup>/s) Sept. 9; minimum gage height, 1.82 ft (0.555 m) Sept. 6, 7, 8, 9.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	42	8.1	72	27	13	14	414	37	34	9.8	.32	.10
2	15	5.7	45	27	14	14	296	35	27	7.0	9.2	.09
3	6.9	6.1	29	25	15	14	289	33	24	5.8	13	.14
4	4.5	5.7	25	22	15	15	291	32	22	5.2	4.7	.10
5	3.3	5.4	20	20	15	15	282	39	21	4.6	2.3	.07
6	2.9	9.1	17	22	15	15	241	34	18	4.3	1.3	.05
7	2.8	7.2	15	20	15	15	224	31	16	3.7	.91	.03
8	10	7.4	14	17	15	16	190	34	20	3.5	.84	.02
9	5.0	11	14	14	15	16	167	35	16	3.2	6.9	.02
10	3.6	33	14	12	15	17	155	32	15	3.0	2.0	.05
11	5.7	14	14	12	15	18	146	34	13	2.6	1.0	.05
12	4.2	10	14	12	15	19	131	44	26	2.8	.77	.66
13	3.4	9.0	16	13	15	21	117	68	17	2.7	.47	14
14	3.1	8.8	19	13	15	23	104	78	15	2.4	.26	30
15	4.4	13	23	13	14	25	94	73	13	2.1	.14	8.4
16	3.8	15	29	13	14	29	86	65	14	1.8	5.2	5.8
17	3.4	14	37	13	14	33	80	60	13	1.7	1.2	22
18	4.4	13	48	13	14	39	74	57	12	1.6	.66	35
19	3.8	11	58	13	14	50	71	54	10	1.2	13	16
20	3.5	25	60	13	14	130	67	64	10	1.1	2.6	13
21	3.6	23	56	13	14	400	63	57	19	1.4	1.4	24
22	3.8	18	50	12	14	877	58	52	9.9	1.3	.77	8.0
23	4.6	19	46	12	14	949	56	48	8.3	2.3	.47	5.1
24	5.1	18	42	11	14	801	55	45	7.5	1.7	.21	3.4
25	5.1	17	40	11	14	430	52	42	6.1	1.2	.17	2.4
26	5.4	15	37	10	14	352	49	38	9.0	2.0	.14	2.6
27	5.6	13	34	10	14	364	46	35	6.4	2.6	2.1	4.0
28	5.8	11	32	10	14	386	44	32	5.7	1.2	2.2	3.1
29	6.0	11	31	10	---	429	42	29	5.1	2.1	.56	2.6
30	6.3	13	30	11	---	320	39	47	5.1	.77	.26	4.9
31	6.0	---	29	12	---	356	---	42	---	.66	.17	---
TOTAL	193.0	389.5	1010	456	403	6202	4022	1406	438.1	87.33	75.22	206.08
MEAN	6.23	13.0	32.6	14.7	14.4	200	134	45.4	14.6	2.82	2.43	6.87
MAX	42	33	72	27	15	949	414	78	34	9.8	13	35
MIN	2.8	5.4	14	10	13	14	39	29	5.1	.66	.14	.02
CFSM	.05	.11	.28	.13	.13	1.74	1.17	.40	.13	.03	.02	.06
IN.	.06	.13	.33	.15	.13	2.01	1.30	.45	.14	.03	.02	.07

CAL YR 1977 TOTAL 10285.23 MEAN 28.2 MAX 299 MIN .21 CFSM .25 IN 3.33  
WTR YR 1978 TOTAL 14888.23 MEAN 40.8 MAX 949 MIN .02 CFSM .36 IN 4.82

## STREAMS TRIBUTARY TO LAKE HURON

04148440 THREAD CREEK NEAR FLINT, MI

LOCATION.--Lat 42°58'30", long 83°38'09", in SE¼ SE¼ sec.28, T.7 N., R.7 E., Genesee County, Hydrologic Unit 04080204, on left bank 20 ft (6 m) downstream from bridge on Bristol Road, 6.0 mi (9.7 km) upstream from mouth, and 4.0 mi (6.4 km) southeast of Flint.

DRAINAGE AREA.--54.4 mi<sup>2</sup> (140.9 km<sup>2</sup>), revised.

PERIOD OF RECORD.--January 1970 to current year.

GAGE.--Water-stage recorder. Datum of gage is 764.36 ft (232.977 m) National Geodetic Vertical Datum of 1929. Prior to May 13, 1970, nonrecording gage at same site and datum.

REMARKS.--Records good except those for the winter period and those below 1.0 ft<sup>3</sup>/s (0.028 m<sup>3</sup>/s), which are poor. Several observations of water temperature were made during the year. Gage-height telemark at station.

AVERAGE DISCHARGE.--8 years, 39.4 ft<sup>3</sup>/s (1.116 m<sup>3</sup>/s), 9.84 in/yr (250 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,260 ft<sup>3</sup>/s (35.7 m<sup>3</sup>/s) Apr. 19, 1975, gage height, 7.65 ft (2.332 m) from high water marks; no flow Aug. 7, 8, 10, 1971.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 407 ft<sup>3</sup>/s (11.5 m<sup>3</sup>/s) Mar. 23, gage height, 5.80 ft (1.768 m); maximum gage height, 6.08 ft (1.853 m) Mar. 21, backwater from ice; only peak discharge above base of 300 ft<sup>3</sup>/s (8.50 m<sup>3</sup>/s); minimum not determined.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	50	7.0	52	18	16	12	130	18	14	5.5	.24	1.2
2	20	7.0	36	17	15	12	129	16	12	7.8	.48	.98
3	13	7.2	30	16	15	12	129	15	11	5.2	13	.92
4	12	7.3	26	16	15	12	124	14	9.5	4.8	3.2	.80
5	11	7.1	22	15	14	12	141	17	9.2	4.2	1.9	.45
6	9.4	9.8	20	15	14	12	128	17	8.0	3.5	1.1	.45
7	8.0	12	18	14	14	12	112	17	7.6	3.2	.68	.35
8	10	12	16	14	14	12	92	19	8.6	2.8	.62	.15
9	9.2	11	16	13	14	13	78	22	8.1	2.3	3.1	.07
10	8.3	24	15	13	13	14	69	25	8.3	2.2	2.5	.03
11	9.6	17	15	13	13	16	62	27	7.5	1.6	1.2	.01
12	12	17	15	13	13	17	55	37	16	1.7	.92	.01
13	9.1	17	17	13	13	19	50	48	13	1.2	.86	4.0
14	8.8	16	20	13	13	21	45	51	9.2	2.4	.45	9.7
15	8.7	16	25	13	13	24	41	59	7.8	1.5	.56	11
16	11	18	30	13	13	27	37	58	7.7	1.1	4.6	5.0
17	8.9	16	39	13	13	31	34	52	7.6	.80	3.0	10
18	8.9	16	50	13	13	38	31	46	6.5	.74	1.4	16
19	9.1	15	58	13	12	47	28	38	5.7	2.6	6.0	12
20	8.4	27	60	13	12	120	29	39	6.1	4.1	4.1	5.3
21	7.8	29	56	13	12	200	29	38	9.9	4.3	2.2	7.5
22	7.7	21	48	14	12	300	28	32	7.1	2.5	1.8	6.1
23	7.4	22	43	14	12	333	27	28	4.7	2.1	1.2	3.8
24	7.1	23	38	14	12	264	29	24	4.1	1.5	.92	3.2
25	7.0	20	35	15	12	229	27	19	4.1	.77	.92	2.6
26	6.8	17	32	15	12	182	26	16	6.4	.82	.80	2.3
27	7.2	15	28	15	12	153	25	14	5.4	1.2	.80	2.3
28	7.0	13	26	16	12	134	22	13	4.4	.70	1.4	4.0
29	6.9	12	22	16	---	129	21	11	3.8	.55	1.1	2.3
30	6.7	11	20	16	---	116	19	12	3.4	.82	1.0	1.9
31	6.6	---	19	16	---	114	---	15	---	.39	1.1	---
TOTAL	323.6	462.4	947	445	368	2637	1797	857	236.7	74.89	63.15	114.42
MEAN	10.4	15.4	30.5	14.4	13.1	85.1	59.9	27.6	7.89	2.42	2.04	3.81
MAX	50	29	60	18	16	333	141	59	16	7.8	13	16
MIN	6.6	7.0	15	13	12	12	19	11	3.4	.39	.24	.01
CFSM	.19	.28	.56	.27	.24	1.56	1.10	.51	.15	.04	.04	.07
IN.	.22	.32	.65	.30	.25	1.80	1.23	.59	.16	.05	.04	.08

CAL YR 1977 TOTAL 7155.64 MEAN 19.6 MAX 154 MIN .55 CFSM .36 IN 4.89  
WTR YR 1978 TOTAL 8326.16 MEAN 22.8 MAX 333 MIN .01 CFSM .42 IN 5.69

## 04148500 FLINT RIVER NEAR FLINT, MI

LOCATION.--Lat 43°02'20", long 83°46'10", in SW¼ sec.4, T.7 N., R.6 E., Genesee County, Hydrologic Unit 04080204, on left bank on grounds of sewage treatment plant, 1.2 mi (1.9 km) upstream from Pirnie Creek, 1.8 mi (2.9 km) downstream from Flint, and 5.0 mi (8.0 km) downstream from Swartz Creek.

DRAINAGE AREA.--956 mi<sup>2</sup> (2,476 km<sup>2</sup>), revised.

PERIOD OF RECORD.--September 1903 to March 1904 (gage heights only), August 1932 to current year. Gage-height records for flood seasons collected in this vicinity 1911-32, are contained in reports of U.S. Weather Bureau.

REVISED RECORDS.--WSP 954: 1941. WSP 1337: 1933-34(M), 1935-37. WSP 2111: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 678.80 ft (206.898 m) National Geodetic Vertical Datum of 1929 (levels by U.S. Weather Bureau and city of Flint).

REMARKS.--Records fair. Some regulation by reservoirs above station (station 04147000). Occasional diversion for industrial use. Since Dec. 17, 1967, flow contains up to 50 ft<sup>3</sup>/s (1.42 m<sup>3</sup>/s) as sewage effluent which originates outside the basin. Several observations of water temperature were made during the year. National Weather Service gage-height telemark at station.

AVERAGE DISCHARGE.--46 years, 574 ft<sup>3</sup>/s (16.26 m<sup>3</sup>/s), 8.15 in/yr (207 mm/yr), adjusted for storage since 1954.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 14,900 ft<sup>3</sup>/s (422 m<sup>3</sup>/s) Apr. 6, 1947, gage height, 16.35 ft (4.983 m); minimum, 9.0 ft<sup>3</sup>/s (0.25 m<sup>3</sup>/s) Aug. 7, 1934.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 4,320 ft<sup>3</sup>/s (122 m<sup>3</sup>/s) Mar. 29, gage height, 10.09 ft (3.075 m); minimum, 103 ft<sup>3</sup>/s (2.92 m<sup>3</sup>/s) Aug. 22, gage height, 2.73 ft (0.832 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	751	393	922	484	339	300	3490	202	417	208	238	158
2	775	373	950	448	353	300	3590	192	362	280	280	153
3	667	365	850	408	357	300	3390	185	323	235	397	142
4	604	365	780	383	356	310	3450	180	289	200	163	180
5	578	369	760	368	355	320	3730	205	283	176	155	439
6	578	469	728	354	358	330	3770	195	344	150	173	387
7	581	574	718	344	369	350	3670	180	259	129	190	324
8	620	570	699	330	371	370	3410	180	220	120	184	301
9	639	389	692	320	370	390	3000	238	241	124	260	302
10	591	696	700	310	364	410	2580	354	232	138	157	260
11	537	597	694	300	360	450	2070	195	211	156	125	201
12	496	538	685	300	357	500	1890	241	232	171	133	325
13	505	505	753	290	353	580	1400	656	283	175	141	408
14	503	473	771	290	350	985	1160	790	244	164	148	508
15	494	449	469	296	346	1230	1220	664	223	143	161	377
16	501	517	258	291	345	1210	1200	732	265	124	236	292
17	479	517	330	291	344	1050	1120	790	229	112	177	471
18	461	501	631	291	340	1010	1120	790	208	107	128	645
19	451	485	840	289	335	1180	1060	755	229	140	239	359
20	432	548	950	284	329	1490	905	770	208	246	128	250
21	416	646	1000	287	326	2980	664	780	229	303	143	295
22	426	628	1000	286	326	3470	584	650	202	308	117	206
23	463	566	980	284	322	3710	592	616	192	271	125	183
24	397	543	930	287	320	4030	592	597	188	215	131	168
25	324	525	850	293	320	3680	521	513	176	204	145	168
26	369	534	800	290	310	3790	580	481	176	210	151	179
27	385	505	750	290	300	4180	400	457	180	231	144	231
28	377	493	650	300	300	4260	306	409	170	197	164	252
29	373	489	574	310	---	4280	247	362	163	208	146	232
30	365	481	560	315	---	3920	226	348	167	196	148	248
31	365	---	524	334	---	3580	---	505	---	189	161	---
TOTAL	15503	15103	22798	9947	9575	54945	51937	14212	7145	5830	5388	8644
MEAN	500	503	735	321	342	1772	1731	458	238	188	174	288
MAX	775	696	1000	484	371	4280	3770	790	417	308	397	645
MIN	324	365	258	284	300	300	226	180	163	107	117	142
MEAN+	500	459	713	317	341	1835	1699	533	238	116	157	207
CFSM+	.52	.48	.75	.33	.36	1.92	1.78	.56	.25	.12	.16	.22
IN+	.60	.54	.86	.38	.37	2.21	1.98	.64	.28	.14	.19	.24

CAL YR 1977 TOTAL 162814 MEAN 446 MAX 2070 MIN 90 MEAN+ 446 CFSM+ .47 IN+ 6.34  
WTR YR 1978 TOTAL 221027 MEAN 606 MAX 4280 MIN 107 MEAN+ 595 CFSM+ .62 IN+ 8.43

\*Adjusted for change in contents in Holloway Reservoir.



## STREAMS TRIBUTARY TO LAKE HURON

04148720 BRENT RUN NEAR MONTROSE, MI

LOCATION.--Lat 43°10'12", long 83°50'03", in SE¼ NE¼ sec.23, T.9 N., R.5 E., Genesee County, Hydrologic Unit 04080204, on right bank 10 ft (3 m) downstream from bridge on Morrish Road, 0.8 mi (1.3 km) upstream from Central-Stadler Drain, 3.0 mi (4.8 km) upstream from mouth, and 3.1 mi (5.0 km) east of Montrose.

DRAINAGE AREA.--20.8 mi<sup>2</sup> (53.9 km<sup>2</sup>), revised.

PERIOD OF RECORD.--January 1970 to current year.

GAGE.--Water-stage recorder. Altitude of gage is 655 ft (200 m) from topographic map (nearest 5 ft). Prior to Aug. 26, 1970, non-recording gage at same site and datum.

REMARKS.--Records good except those for the winter period, which are fair. Several observations of water temperature were made during the year.

AVERAGE DISCHARGE.--8 years, 15.6 ft<sup>3</sup>/s (0.442 m<sup>3</sup>/s), 10.18 in/yr (259 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 730 ft<sup>3</sup>/s (20.7 m<sup>3</sup>/s) Dec. 31, 1972, gage height, 6.34 ft (1.932 m); maximum gage height, 7.08 ft (2.158 m) Mar. 15, 1971, backwater from ice; minimum discharge, 2.1 ft<sup>3</sup>/s (0.059 m<sup>3</sup>/s) Sept. 5, 1973; minimum gage height, 1.01 ft (0.308 m) Aug. 9, 17, 1971.

EXTREMES FOR CURRENT YEAR.--Peak discharges above base of 250 ft<sup>3</sup>/s (7.08 m<sup>3</sup>/s) and maximum (\*):

Date	Time	Discharge (ft <sup>3</sup> /s) (m <sup>3</sup> /s)	Gage height (ft) (m)	Date	Time	Discharge (ft <sup>3</sup> /s) (m <sup>3</sup> /s)	Gage height (ft) (m)
Mar. 22	0200	*331 9.37	*4.49 1.369	Mar. 23	1500	253 7.16	3.95 1.204

Minimum discharge, 2.6 ft<sup>3</sup>/s (0.074 m<sup>3</sup>/s) July 11, 12, 18, 19, 25, 26; minimum gage height, 1.09 ft (0.332 m) Sept. 11.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	28	4.8	32	7.0	6.4	4.8	54	6.5	8.2	4.9	2.9	4.5
2	54	6.1	70	6.5	6.2	4.8	36	6.4	6.7	15	3.5	4.4
3	10	5.7	18	6.0	6.2	4.9	25	6.3	6.3	6.4	5.4	4.2
4	6.0	5.6	14	6.0	6.0	5.0	34	6.3	5.6	4.2	6.8	4.1
5	5.2	5.4	12	5.7	6.0	5.1	115	7.5	5.4	3.6	3.9	3.7
6	4.6	8.8	11	5.5	5.8	5.2	44	12	5.1	3.6	3.3	3.8
7	4.3	21	10	5.5	5.6	5.3	30	8.6	5.0	3.7	3.3	4.4
8	5.2	8.7	9.5	5.5	5.4	5.4	20	7.8	6.0	3.7	2.9	4.6
9	14	7.6	9.0	5.4	5.2	5.5	14	11	8.3	3.7	3.7	4.4
10	7.7	25	8.5	5.2	5.0	5.6	13	11	5.9	3.0	9.5	4.3
11	5.5	33	8.5	5.2	5.0	6.0	12	8.9	5.1	2.7	4.4	3.0
12	7.6	9.7	8.5	5.2	4.9	6.3	12	14	5.3	3.4	3.8	3.2
13	7.5	7.8	9.0	5.2	4.9	6.6	11	18	10	3.4	3.5	5.4
14	5.8	7.3	10	5.4	4.8	7.0	10	26	6.4	3.8	3.3	15
15	5.2	6.8	12	5.4	4.8	8.0	9.1	14	5.4	3.8	2.8	17
16	6.9	9.6	13	5.4	4.8	9.0	8.8	11	5.5	3.4	3.8	8.5
17	8.4	11	14	5.4	4.7	10	7.9	9.8	7.8	2.9	7.3	8.5
18	5.4	8.7	16	5.4	4.7	12	7.3	9.2	6.2	2.7	4.2	33
19	5.3	7.6	18	5.6	4.7	15	8.2	9.2	4.7	3.4	5.0	37
20	5.2	10	15	5.6	4.7	30	8.8	9.4	4.1	3.3	15	11
21	5.1	35	12	5.8	4.6	130	8.2	22	6.5	3.6	5.8	7.6
22	5.0	14	11	6.0	4.6	237	7.6	11	11	4.7	4.7	10
23	4.6	9.9	9.5	6.0	4.6	187	7.3	8.9	5.2	3.8	4.4	5.2
24	4.4	9.0	9.5	6.2	4.6	171	7.3	8.3	4.7	3.0	4.3	4.2
25	4.2	8.5	9.0	6.4	4.6	63	7.9	7.7	4.5	2.9	4.2	4.1
26	4.3	8.0	9.0	6.6	4.6	34	7.3	7.0	4.9	3.0	4.2	3.2
27	5.3	8.0	9.0	6.6	4.7	45	7.1	6.6	6.9	8.8	4.4	3.3
28	5.6	8.0	8.5	6.6	4.7	49	7.0	6.1	4.7	5.7	5.5	8.2
29	4.8	8.0	8.0	6.6	---	71	7.1	5.6	4.1	3.8	7.1	5.0
30	3.7	9.0	8.0	6.6	---	38	7.0	5.3	4.4	4.5	5.0	3.5
31	3.9	---	7.5	6.4	---	38	---	9.5	---	3.5	4.4	---
TOTAL	252.7	327.6	419.0	181.9	142.8	1224.5	553.9	310.9	179.9	131.9	152.3	238.3
MEAN	8.15	10.9	13.5	5.87	5.10	39.5	18.5	10.0	6.00	4.25	4.91	7.94
MAX	54	35	70	7.0	6.4	237	115	26	11	15	15	37
MIN	3.7	4.8	7.5	5.2	4.6	4.8	7.0	5.3	4.1	2.7	2.8	3.0
CFSM	.39	.52	.65	.28	.25	1.90	.89	.48	.29	.20	.24	.38
IN.	.45	.59	.75	.33	.26	2.19	.99	.56	.32	.24	.27	.43

CAL YR 1977	TOTAL	3521.1	MEAN	9.65	MAX	81	MIN	2.9	CFSM	.46	IN	6.30
WTR YR 1978	TOTAL	4115.7	MEAN	11.3	MAX	237	MIN	2.7	CFSM	.54	IN	7.36

## 297

LOCATION.--Lat 43°18'30", long 83°57'13", in SE<sub>4</sub> SE<sub>4</sub> sec.35, T.11 N., R.4 E., Saginaw County, Hydrologic Unit 04080204, on left bank 20 ft (6 m) downstream from bridge on State Highway 13, 2 mi (3 km) west of Fosters and 6.5 mi (10.5 km) downstream from Silver Creek. Records include flow of Birch Run.

PERIOD OF RECORD.--October 1939 to current year. Monthly discharge only for some periods, published in WSP 1307. Gage-height records for flood seasons collected in this vicinity 1910-20, 1922-27 are contained in reports of U.S. Weather Bureau.

3AGE.--Water-stage recorder. Altitude of gage is 600 ft (183 m) from topographic map. Prior to Oct. 1, 1969, nonrecording gage at site 2.2 mi (3.5 km) upstream at datum 582.22 ft (177.461 m) National Geodetic Vertical Datum of 1929.

AVERAGE DISCHARGE,--39 years, 729 ft<sup>3</sup>/s (20.65 m<sup>3</sup>/s), 8.33 in/yr (212 mm/yr).

EXTREMES OUTSIDE PERIOD OF RECORD.--Flood of March 1904, reached a stage of 18.4 ft (5.61 m) from U.S. Weather Bureau data, site and datum then in use.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 6,700 ft<sup>3</sup>/s (190 m<sup>3</sup>/s) Mar. 24, based on correlations with nearby stations; maximum gage height, 15.75 ft (4.801 m) Mar. 23; minimum discharge, 138 ft<sup>3</sup>/s (3.91 m<sup>3</sup>/s) July 18, gage height, 1.89 ft (0.576 m).

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	764	396	814	560	385	370	5180	313	490	232	232	196
2	1330	429	1380	520	390	370	5100	292	424	377	254	200
3	851	403	1080	490	400	380	4780	286	386	309	345	195
4	676	400	968	450	410	380	4800	273	349	247	386	189
5	622	396	914	430	420	390	5300	288	324	231	229	216
6	604	415	893	420	430	400	4990	324	365	214	198	415
7	609	617	842	410	440	430	5000	292	342	191	213	381
8	620	713	840	400	440	450	4660	277	273	171	225	333
9	731	566	830	390	440	470	4040	309	277	164	238	304
10	625	682	820	380	440	500	3340	412	283	175	294	307
11	550	917	820	370	440	550	2580	386	262	191	232	275
12	512	713	840	370	430	600	2210	311	249	211	193	238
13	506	620	850	360	430	800	1790	520	347	225	178	331
14	555	574	850	360	420	970	1290	1120	302	223	187	427
15	504	531	750	350	420	1430	1360	860	262	196	193	541
16	536	571	500	350	420	1420	1440	824	277	171	207	400
17	504	628	350	350	410	1340	1310	899	326	158	271	324
18	485	604	600	340	410	1200	1250	899	231	143	231	568
19	482	571	900	340	410	1260	1240	890	267	148	207	660
20	460	593	1150	340	400	1690	1120	812	258	265	269	400
21	439	884	1250	340	400	3110	863	992	252	386	207	313
22	453	854	1250	340	400	5100	719	827	290	368	177	331
23	482	713	1200	340	390	5930	687	707	241	313	180	260
24	533	679	1100	350	390	6520	707	674	243	238	161	231
25	326	679	1000	350	380	5970	606	603	238	207	171	218
26	374	684	900	350	380	5250	722	539	236	231	180	211
27	400	630	850	360	380	5440	707	512	249	234	191	216
28	405	595	800	360	380	5460	458	470	238	260	195	260
29	400	585	700	360	---	5980	377	420	227	231	209	281
30	396	574	650	370	---	5570	340	391	213	234	193	260
31	381	---	600	380	---	5110	---	528	---	234	189	---
TOTAL	17115	18216	27291	11880	11485	74840	68966	17250	8721	7178	6835	9481
MEAN	552	607	880	383	410	2414	2299	556	291	232	220	316
MAX	1330	917	1380	560	440	6520	5300	1120	490	386	386	660
MIN	326	396	350	340	380	370	340	273	213	143	161	189
CAL YR 1977	TOTAL	191626	MEAN	525	MAX	2390	MIN	110				
CTR YR 1978	TOTAL	279258	MEAN	765	MAX	6520	MIN	143				

## STREAMS TRIBUTARY TO LAKE HURON

04149500 FLINT RIVER NEAR ALICIA, MI

LOCATION.--Lat 43°18'40", long 84°02'00", in SE¼ sec.31, T.11 N., R.4 E., Saginaw County, Hydrologic Unit 04080204, on left bank 100 ft (30 m) downstream from the Prairie Farms Association flood-pumping station, 2.8 mi (4.5 km) north of Alicia, and 4 mi (6 km) upstream from mouth.

PERIOD OF RECORD.--November 1948 to current year (gage heights only).

GAGE.--Water-stage recorder. Datum of gage is 577.00 ft (175.870 m) National Geodetic Vertical Datum of 1929.

REMARKS.--Records good. Records represent stages in the Shiawassee Flats area.

EXTREMES FOR PERIOD OF RECORD.--Maximum gage height, 13.70 ft (4.176 m) Apr. 3, 1960; minimum, less than 1.5 ft (0.46 m) during many days in 1949, 1958, 1959, 1963, 1964, 1966-69.

EXTREMES FOR CURRENT YEAR.--Maximum gage height, 10.09 ft (3.075 m) Mar. 26; minimum, 2.01 ft (0.613 m) Nov. 10, 11.

GAGE HEIGHT, IN FEET, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	4.98	2.65	3.33	3.70		---	9.83	3.70	3.79	3.48	3.65	3.58
2	5.15	2.86	3.71	3.34		---	10.00	3.51	3.44	3.72	3.34	3.21
3	4.63	2.94	4.41	3.43		---	9.96	3.42	3.73	4.07	3.86	3.92
4	4.20	3.55	4.24	3.28		---	9.93	3.95	3.38	3.78	3.64	3.60
5	3.72	3.79	4.73	3.47		---	9.75	3.91	3.71	3.47	3.56	3.64
6	3.75	3.34	4.96	3.46		---	9.69	3.46	3.24	3.20	3.58	3.15
7	3.80	3.50	4.31	3.26		---	9.57	3.45	3.28	3.38	3.59	3.87
8	3.25	3.23	4.08	3.31		---	9.36	3.09	3.69	3.26	3.17	3.72
9	2.82	3.11	3.60	3.39		---	9.00	2.60	3.63	3.53	3.58	3.85
10	3.37	2.44	3.75	3.38		---	8.33	3.31	3.39	3.82	3.87	3.35
11	3.03	2.76	3.65	3.48		---	7.35	2.91	2.92	3.79	3.64	3.42
12	2.85	3.92	3.37	3.44		---	6.64	3.10	3.47	3.45	3.52	4.58
13	3.62	3.36	3.66	3.30		3.33	6.01	3.63	4.05	3.24	3.40	3.95
14	3.27	3.04	3.98	3.70		3.77	5.42	4.12	3.70	3.72	3.54	3.23
15	3.66	3.03	4.06	3.07		4.50	5.13	4.63	3.49	3.53	3.41	3.24
16	3.93	3.00	3.88	---		4.53	4.95	4.57	3.14	3.90	2.69	3.90
17	3.24	3.02	3.80	---		4.29	4.69	4.55	3.38	3.56	3.51	3.88
18	3.02	2.58	3.80	---		4.08	4.50	4.31	3.53	3.25	3.48	4.26
19	3.24	3.10	4.84	---		4.04	4.28	4.03	3.78	3.33	3.33	3.98
20	3.12	3.03	5.60	---		4.47	4.55	3.82	3.55	3.56	3.85	3.66
21	2.94	2.42	5.45	---		5.60	4.23	4.31	3.48	3.86	3.51	4.16
22	3.32	3.62	5.31	---		7.33	3.80	3.85	3.52	3.61	3.47	4.09
23	3.37	3.57	4.90	---		8.78	3.56	3.87	3.79	3.51	3.57	3.76
24	3.02	3.05	4.75	---		9.63	3.57	3.85	3.61	3.75	3.59	3.61
25	2.93	3.73	4.26	2.89		10.00	4.24	3.70	3.34	3.50	3.83	4.16
26	2.91	4.31	4.60	3.63		10.02	3.94	3.63	3.16	3.49	3.61	3.35
27	3.01	3.43	4.52	2.83		9.68	3.67	3.50	3.45	3.61	3.60	3.75
28	3.20	3.07	4.28	2.93		9.38	3.44	3.48	3.62	3.87	3.11	3.94
29	3.20	3.36	4.05	2.89		9.66	3.70	3.46	3.56	3.44	3.58	3.52
30	3.15	3.55	3.91	2.76		9.81	3.73	3.29	3.87	4.12	3.76	3.38
31	2.75	---	3.82	---		9.76	---	3.53	---	3.62	3.78	---
MEAN	3.43	3.21	4.25	---		---	6.23	3.69	3.52	3.59	3.54	3.72
MAX	5.15	4.31	5.60	---		---	10.00	4.63	4.05	4.12	3.87	4.58
MIN	2.75	2.42	3.33	---		---	3.44	2.60	2.92	3.20	2.69	3.15

## 04150000 SOUTH BRANCH CASS RIVER NEAR CASS CITY, MI

LOCATION.--Lat 43°34'01", long 83°06'43", in SW¼ NW¼ sec.7, T.13 N., R.12 E., Sanilac County, Hydrologic Unit 04080205, on left bank 1.5 mi (2.4 km) downstream from bridge on State Highway 53, 3.9 mi (6.3 km) southeast of Cass City, 4.2 mi (6.8 km) upstream from confluence with North Branch.

DRAINAGE AREA.--238 mi<sup>2</sup> (616 km<sup>2</sup>), revised.

PERIOD OF RECORD.--October 1948 to current year. Monthly discharge only for some periods, published in WSP 1307. Prior to October 1963, published as East Branch Cass River near Cass City.

REVISED RECORDS.--WSP 1337: 1949-50. WSP 1707: 1951-53, 1959.

GAGE.--Water-stage recorder. Datum of gage is 719.5 ft (219.3 m) National Geodetic Vertical Datum of 1929. Prior to Nov. 8, 1952, nonrecording gage at site 1.5 mi (2.4 km) upstream at different datum.

REMARKS.--Records good except those for the winter period, which are poor. Several observations of water temperature were made during the year.

AVERAGE DISCHARGE.--30 years, 124 ft<sup>3</sup>/s (3.512 m<sup>3</sup>/s), 7.08 in/yr (180 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 6,400 ft<sup>3</sup>/s (181 m<sup>3</sup>/s) Mar. 28, 1967, gage height, 14.86 ft (4.529 m); minimum, 0.2 ft<sup>3</sup>/s (0.006 m<sup>3</sup>/s) Sept. 20-23, 1955, Aug. 19, 20, 1958.

EXTREMES FOR CURRENT YEAR.--Peak discharges above base of 1,100 ft<sup>3</sup>/s (31.2 m<sup>3</sup>/s) and maximum (\*):

Date	Time	Discharge (ft <sup>3</sup> /s) (m <sup>3</sup> /s)	Gage height (ft) (m)	Date	Time	Discharge (ft <sup>3</sup> /s) (m <sup>3</sup> /s)	Gage height (ft) (m)
Dec. 2	--	1520 43.0	ice jam	Apr. 1	2200	2670 75.6	9.81 2.990
Mar. 24	0100	*3720 105	*a12.21 3.722	Apr. 5	0400	2580 73.1	9.67 2.947
Mar. 29	--	2500 70.8	ice jam				

a Ice jam.

Minimum discharge, 2.9 ft<sup>3</sup>/s (0.082 m<sup>3</sup>/s) Sept. 10; minimum gage height, 1.72 ft (0.524 m) Sept. 6, 10.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	165	25	450	49	27	27	2230	48	36	9.8	5.6	3.5
2	776	24	1300	45	27	27	1830	45	31	12	5.2	3.4
3	613	24	400	42	27	27	988	41	31	11	5.2	3.4
4	315	23	200	39	27	27	1520	39	28	11	5.2	3.4
5	183	21	120	37	27	27	2120	39	27	10	5.0	3.3
6	118	23	100	36	27	27	940	42	25	9.6	5.1	3.1
7	86	29	90	34	27	27	848	41	23	8.6	4.8	3.2
8	87	46	84	33	27	27	601	39	23	7.7	4.4	3.4
9	268	67	78	33	27	27	359	44	23	7.6	4.5	3.2
10	309	120	74	32	27	28	279	50	22	7.1	4.8	2.9
11	185	271	71	31	27	29	270	49	21	7.1	4.7	3.0
12	153	201	68	30	27	32	261	55	21	6.8	4.6	3.5
13	147	120	65	29	27	40	208	96	23	6.4	4.4	3.9
14	116	84	68	28	27	48	163	217	25	6.6	4.0	13
15	89	68	80	28	27	60	134	211	23	6.3	3.8	40
16	83	70	115	28	27	70	117	153	20	6.0	3.8	45
17	105	99	200	28	27	84	103	116	20	5.6	3.8	32
18	99	106	350	27	27	110	93	99	21	5.4	3.7	22
19	84	86	600	27	27	138	94	91	20	5.6	4.5	46
20	73	84	570	27	27	185	99	86	17	5.6	5.5	76
21	60	238	400	27	27	300	104	188	17	9.4	4.9	96
22	51	266	250	27	27	1000	93	228	17	9.0	5.1	118
23	45	159	170	27	27	2100	80	146	19	9.8	4.8	122
24	39	139	120	27	27	3650	80	110	15	8.3	4.2	72
25	35	169	105	27	27	3500	90	88	13	6.5	4.3	38
26	34	130	97	27	27	1900	84	75	13	6.2	4.6	22
27	32	108	90	27	27	940	73	63	12	6.3	4.0	15
28	31	90	80	27	27	900	64	53	10	6.0	3.8	13
29	28	100	70	27	---	2100	58	45	9.8	6.4	3.8	12
30	26	110	61	27	---	1380	53	40	9.7	6.5	3.6	11
31	24	---	54	27	---	1470	---	39	---	5.9	3.5	---
TOTAL	4459	3100	6580	960	756	20307	14036	2676	614.5	236.1	139.2	836.2
MEAN	144	103	212	31.0	27.0	655	468	86.3	20.5	7.62	4.49	27.9
MAX	776	271	1300	49	27	3650	2230	228	36	12	5.6	122
MIN	24	21	54	27	27	27	53	39	9.7	5.4	3.5	2.9
CFSM	.61	.43	.89	.13	.11	2.75	1.97	.36	.09	.03	.02	.12
IN.	.70	.48	1.03	.15	.12	3.17	2.19	.42	.10	.04	.02	.13

CAL YR 1977	TOTAL	33980.5	MEAN	93.1	MAX	1300	MIN	3.1	CFSM	.39	IN	5.31
WTR YR 1978	TOTAL	54700.0	MEAN	150	MAX	3650	MIN	2.9	CFSM	.63	IN	8.55

STREAMS TRIBUTARY TO LAKE HURON  
04150500 CASS RIVER AT CASS CITY, MI

LOCATION.--Lat 43°35'03", long 83°10'34", in NE¼ NE¼ sec.4, T.13 N., R.11 E., Tuscola County, Hydrologic Unit 04080205, on left bank 600 ft (183 m) downstream from bridge on Cemetery Road, 0.3 mi (0.5 km) downstream from confluence of North and South Branches, and 1.1 mi (1.8 km) south of Cass City.

DRAINAGE AREA.--359 mi<sup>2</sup> (930 km<sup>2</sup>), revised.

PERIOD OF RECORD.--October 1947 to current year. Monthly discharge only for some periods, published in WSP 1307.

REVISED RECORDS.--WSP 1337: 1949-50. WSP 1727: 1948 (M), 1950.

GAGE.--Water-stage recorder. Datum of gage is 697.92 ft (212.726 m) National Geodetic Vertical Datum of 1929. Prior to Nov. 14, 1952 nonrecording gage at site 600 ft (183 m) upstream at present datum.

REMARKS.--Records good except those for the winter period, which are fair. Several observations of water temperature were made during the year.

AVERAGE DISCHARGE.--31 years, 201 ft<sup>3</sup>/s (5.692 m<sup>3</sup>/s), 7.60 in/yr (193 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 8,460 ft<sup>3</sup>/s (240 m<sup>3</sup>/s) Mar. 20, 1948, gage height, 15.80 ft (4.816 m), from graph based on gage readings; minimum, 0.50 ft<sup>3</sup>/s (0.014 m<sup>3</sup>/s) Sept. 26, 1948.

EXTREMES FOR CURRENT YEAR.--Peak discharges above base of 1,400 ft<sup>3</sup>/s (39.6 m<sup>3</sup>/s) and maximum (\*):

Date	Time	Discharge (ft <sup>3</sup> /s) (m <sup>3</sup> /s)	Gage height (ft) (m)	Date	Time	Discharge (ft <sup>3</sup> /s) (m <sup>3</sup> /s)	Gage height (ft) (m)
Dec. 2	--	1780 50.4	ice jam	Apr. 1	2400	3260 92.3	10.87 3.313
Mar. 24	2000	*4570 129	*a12.51 3.813	Apr. 5	0400	3020 85.5	10.58 3.225
Mar. 29	1100	3440 97.4	11.07 3.374				

a Ice jam.

Minimum discharge, 2.8 ft<sup>3</sup>/s (0.079 m<sup>3</sup>/s) Sept. 8, 11, gage height, 4.41 ft (1.344 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	265	72	520	110	52	52	2800	91	63	12	7.0	3.4
2	992	71	1600	102	52	51	2670	86	58	14	6.5	3.4
3	903	69	1000	97	52	50	1580	78	52	14	6.2	3.3
4	588	69	630	92	52	50	1960	73	47	13	6.0	3.2
5	447	65	350	88	52	50	2680	73	43	13	5.7	3.3
6	327	70	275	82	52	50	1510	74	40	12	5.6	3.2
7	239	85	240	77	52	50	1350	73	36	12	5.5	3.0
8	213	107	220	73	52	50	1080	72	35	10	4.9	3.0
9	431	131	200	70	52	51	757	80	35	10	4.7	3.3
10	517	189	185	68	52	52	591	85	36	9.5	4.7	3.1
11	411	356	175	65	52	54	524	85	31	9.5	4.9	2.8
12	376	310	165	62	52	56	484	95	30	9.0	4.7	4.4
13	337	226	160	60	52	58	412	149	32	8.0	4.5	4.6
14	271	182	155	58	52	62	346	287	31	7.6	4.3	11
15	217	157	180	57	52	70	287	309	31	7.4	4.1	32
16	210	158	250	57	52	84	241	247	27	6.9	4.1	48
17	234	198	400	56	52	100	209	201	26	6.3	4.2	55
18	220	215	620	55	52	120	186	172	26	5.7	4.1	53
19	212	200	850	54	52	160	183	156	26	5.6	5.2	59
20	205	198	900	52	52	250	187	153	25	5.7	6.1	83
21	178	393	800	52	52	480	188	262	25	7.4	6.6	99
22	152	443	640	52	52	1100	177	315	23	11	5.8	105
23	132	340	450	52	52	2400	156	225	22	10	6.3	122
24	115	306	350	52	52	4000	153	179	20	12	5.6	88
25	103	270	275	52	52	3700	160	144	18	9.8	4.7	59
26	95	250	220	52	52	2200	148	120	18	8.8	4.9	42
27	91	230	190	52	52	1540	133	99	17	9.1	5.1	33
28	85	210	165	52	52	1500	119	85	15	8.3	4.4	29
29	80	205	150	52	---	3080	108	71	14	8.2	4.0	27
30	74	200	135	52	---	2150	98	65	12	8.8	3.7	25
31	72	---	120	52	---	2230	---	74	---	7.7	3.5	---
TOTAL	8792	5975	12570	2007	1456	25900	21477	4278	914	292.3	157.6	1014.0
MEAN	284	199	405	64.7	52.0	835	716	138	30.5	9.43	5.08	33.8
MAX	992	443	1600	110	52	4000	2800	315	63	14	7.0	122
MIN	72	65	120	52	52	50	98	65	12	5.6	3.5	2.8
CFSM	.79	.55	1.13	.18	.15	2.33	1.99	.38	.09	.03	.01	.09
IN.	.91	.62	1.30	.21	.15	2.68	2.23	.44	.09	.03	.02	.11

CAL YR 1977	TOTAL	63903.3	MEAN 175	MAX 1600	MIN 4.5	CFSM .49	IN 6.62
WTR YR 1978	TOTAL	84832.9	MEAN 232	MAX 4000	MIN 2.8	CFSM .65	IN 8.79



## STREAMS TRIBUTARY TO LAKE HURON

301

## 04150800 CASS RIVER AT WAHJAMEGA, MI

LOCATION.--Lat 43°27'02", long 83°26'29", in NW¼ NW¼ sec.20, T.12 N., R.9 E., Tuscola County, Hydrologic Unit 04080205, on right bank 90 ft (27 m) upstream from bridge on Chambers Road, on grounds of Caro Regional Center at Wahjamega, 1.9 mi (3.1 km) downstream from Michigan Sugar Co. dam, and 40 mi (64 km) upstream from mouth.

DRAINAGE AREA.--645 mi<sup>2</sup> (1,671 km<sup>2</sup>), revised.

PERIOD OF RECORD.--October 1968 to current year.

GAGE.--Water-stage recorder. Altitude of gage is 650 ft (198 m) from topographic map. Prior to June 19, 1969, nonrecording gage at bridge 90 ft (27 m) downstream at present datum.

REMARKS.--Records good except those for the winter period, which are fair. Some regulation by dam at Michigan Sugar Co., 1.9 mi (3.1 km) above station. Several observations of water temperature were made during the year. National Weather Service gage-height telemark at station.

AVERAGE DISCHARGE.--10 years, 407 ft<sup>3</sup>/s (11.53 m<sup>3</sup>/s), 8.57 in/yr (218 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 11,700 ft<sup>3</sup>/s (331 m<sup>3</sup>/s) Mar. 6, 1976, gage height, 19.92 ft (6.072 m); minimum, 22 ft<sup>3</sup>/s (0.62 m<sup>3</sup>/s) Sept. 22, 1969, part or all of each day Aug. 9, 10, 16-22, 1971, Sept. 7-13, 1978.

EXTREMES FOR CURRENT YEAR.--Peak discharges above base of 2,400 ft<sup>3</sup>/s (68.0 m<sup>3</sup>/s) and maximum (\*):

Date	Time	Discharge (ft <sup>3</sup> /s) (m <sup>3</sup> /s)	Gage height (ft) (m)	Date	Time	Discharge (ft <sup>3</sup> /s) (m <sup>3</sup> /s)	Gage height (ft) (m)
Dec. 2	2100	2720 77.0	10.31 3.142	Apr. 2	0700	4670 132	13.61 4.148
Mar. 25	0700	*6880 195	*16.18 4.932	Apr. 5	1400	4100 116	12.66 3.859
Mar. 29	2300	4850 137	13.91 4.240				

Minimum discharge, 22 ft<sup>3</sup>/s (0.62 m<sup>3</sup>/s) Sept. 7-13; minimum gage height, 2.83 ft (0.863 m) Sept. 8-13.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	546	181	664	215	149	120	3990	214	287	59	33	24
2	1420	182	2360	205	149	120	4460	203	224	63	32	24
3	1590	180	2140	199	149	119	2970	193	191	60	31	24
4	1040	179	1210	192	148	118	2750	185	168	56	37	23
5	756	170	887	184	147	118	3900	184	167	54	35	23
6	588	179	580	180	146	118	2930	194	144	52	34	23
7	443	208	390	175	145	117	2220	195	132	51	33	22
8	405	243	330	172	145	116	1960	192	140	49	31	22
9	623	274	315	170	144	115	1360	216	131	48	30	22
10	822	373	305	165	143	114	1080	237	118	46	29	22
11	702	567	300	163	142	114	952	236	108	43	29	22
12	622	625	298	162	141	115	886	255	118	41	28	24
13	570	481	299	162	141	120	781	352	124	39	28	27
14	492	387	325	161	140	140	665	628	115	39	28	30
15	412	338	401	160	139	170	564	692	107	38	27	33
16	374	332	518	160	138	205	485	563	106	36	27	66
17	386	369	701	159	137	250	426	458	106	35	26	127
18	390	407	997	158	136	300	383	389	115	34	25	135
19	362	390	1450	157	133	390	373	342	107	33	27	141
20	345	387	1710	156	132	500	385	319	96	31	27	148
21	321	611	1530	155	131	806	378	447	94	33	27	199
22	288	794	1100	155	130	1640	357	576	87	33	27	201
23	257	666	860	155	130	3300	326	459	81	34	27	196
24	235	587	640	154	129	5690	329	353	74	35	27	186
25	223	598	510	152	128	6450	344	287	74	35	27	152
26	211	450	420	152	125	4740	327	242	120	36	27	115
27	204	415	370	151	122	3120	295	211	91	36	26	100
28	194	400	310	150	121	2710	265	186	72	36	26	93
29	188	370	270	150	---	4170	246	166	61	35	26	79
30	181	356	250	150	---	4080	227	171	59	35	26	74
31	176	---	230	150	---	3380	---	375	---	34	25	---
TOTAL	15366	11699	22670	5129	3860	43565	36614	9720	3617	1289	888	2377
MEAN	496	390	731	165	138	1405	1220	314	121	41.6	28.6	79.2
MAX	1590	794	2360	215	149	6450	4460	692	287	63	37	201
MIN	176	170	230	150	121	114	227	166	59	31	25	22
CFSM	.77	.61	1.13	.26	.21	2.18	1.89	.49	.19	.06	.04	.12
IN.	.89	.67	1.31	.30	.22	2.51	2.11	.56	.21	.07	.05	.14

CAL YR 1977	TOTAL	112868	MEAN 309	MAX 2520	MIN 29	CFSM .48	IN 6.51
WTR YR 1978	TOTAL	156794	MEAN 430	MAX 6450	MIN 22	CFSM .67	IN 9.04

## STREAMS TRIBUTARY TO LAKE HURON

04151500 CASS RIVER AT FRANKENMUTH, MI

LOCATION.--Lat 43°19'40", long 83°44'53", in NW¼ Sec. 27, T.11 N., R.6 E., Saginaw County, Hydrologic Unit 04080205, on right bank 2,000 ft (610 m) below dam in Frankenmuth, 3,600 ft (1,097 m) above highway bridge on Dehmel Road, 3.4 mi (5.5 km) upstream from Dead Creek, and 17 mi (27 km) upstream from mouth.

DRAINAGE AREA.--841 mi<sup>2</sup> (2,178 km<sup>2</sup>), revised.

PERIOD OF RECORD.--February 1908 to March 1909, July 1935 to September 1936, June 1939 to current year.

REVISED RECORDS.--WSP 1307: 1936(M), 1940(M). WSP 1727: 1952. WSP 1911: 1952.

GAGE.--Water-stage recorder. Datum of gage is 583.96 ft (177.991 m) National Geodetic Vertical Datum of 1929 (levels by Michigan Department of Natural Resources). February 1908 to March 1909, nonrecording gage at site 2,000 ft (610 m) upstream at datum 1.81 ft (0.552 m) lower. July 18 to Sept. 11, 1935, nonrecording gage, Sept. 12, 1935, to Sept. 30, 1936, and June 20, 1939, to Sept. 30, 1949, water-stage recorder, at site 3,600 ft (1,097 m) downstream at datum 0.04 ft (0.012 m) higher.

REMARKS.--Records good except those for the winter period, which are poor. Occasional regulation by dams above station. Prior to 1950, regulation at low and medium flows by mill above station. Several observations of water temperature were made during the year.

AVERAGE DISCHARGE.--40 years, 479 ft<sup>3</sup>/s (13.57 m<sup>3</sup>/s), 7.73 in/yr (196 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 17,700 ft<sup>3</sup>/s (501 m<sup>3</sup>/s) Mar. 18, 1942, gage height, 20.88 ft (6.364 m), site and datum then in use; maximum gage height, 23.37 ft (7.123 m) Feb. 3, 1968, backwater from ice; minimum daily discharge, about 1.5 ft<sup>3</sup>/s (0.042 m<sup>3</sup>/s) Aug. 6, 1944.

EXTREMES FOR CURRENT YEAR.--Peak discharges above base of 3,500 ft<sup>3</sup>/s (99.1 m<sup>3</sup>/s) and maximum (\*):

Date	Time	Discharge (ft <sup>3</sup> /s) (m <sup>3</sup> /s)	Gage height (ft) (m)	Date	Time	Discharge (ft <sup>3</sup> /s) (m <sup>3</sup> /s)	Gage height (ft) (m)
Mar. 25	1000	*8090 229	*18.92 5.767	Apr. 2	1800	5380 152	16.42 5.005
Mar. 30	0900	5610 159	16.68 5.084	Apr. 5	2300	4810 136	15.76 4.804

Minimum discharge, 22 ft<sup>3</sup>/s (0.62 m<sup>3</sup>/s) Sept. 11, gage height, 3.10 ft (0.945 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	963	254	749	250	178	148	4620	280	388	86	46	29
2	1790	273	1870	250	178	147	5210	265	300	87	47	29
3	2090	264	2780	245	174	146	4410	255	248	90	48	27
4	1590	260	1830	235	178	144	3800	243	213	84	45	25
5	1120	248	1190	225	178	142	4480	239	202	78	48	25
6	867	245	800	215	176	139	4290	255	188	76	47	25
7	688	287	590	212	175	138	2980	257	167	73	45	26
8	592	332	500	210	175	137	2570	253	169	70	44	25
9	743	359	460	208	173	136	1960	284	175	69	47	25
10	958	549	450	205	172	135	1510	313	158	65	42	24
11	966	674	450	212	172	136	1310	319	140	62	40	23
12	844	772	450	210	170	140	1200	351	136	58	38	34
13	766	661	465	199	170	150	1070	456	159	57	36	46
14	679	529	500	197	169	180	923	751	149	59	34	72
15	595	458	560	195	168	220	789	891	137	57	34	80
16	574	454	720	192	166	275	674	788	133	52	35	71
17	550	496	945	190	164	350	597	634	139	50	36	93
18	551	520	1290	190	162	460	540	544	143	50	37	149
19	530	504	1850	188	160	640	506	470	143	48	44	164
20	487	524	2100	187	160	907	521	412	130	47	46	158
21	457	764	2070	185	158	1590	515	509	125	55	38	251
22	419	934	1650	185	154	2670	483	629	120	58	36	255
23	375	886	1310	182	154	4710	441	608	112	53	35	222
24	338	783	880	182	152	6820	416	467	103	50	35	208
25	316	766	680	182	152	7880	428	376	97	50	36	186
26	307	640	560	180	150	6990	425	316	108	53	35	151
27	290	540	520	180	150	4640	392	271	136	59	34	125
28	280	520	430	180	148	3620	361	237	110	58	35	121
29	267	490	340	180	---	4460	333	209	93	53	35	112
30	255	465	350	180	---	5380	303	192	86	50	33	100
31	245	---	270	180	---	4260	---	285	---	47	31	---
TOTAL	21492	15451	29609	6211	4640	57890	48057	12359	4707	1904	1222	2881
MEAN	693	515	955	200	166	1867	1602	399	157	61.4	39.4	96.0
MAX	2090	934	2780	250	178	7880	5210	891	388	90	48	255
MIN	245	245	270	180	148	135	303	192	86	47	31	23
CFSM	.82	.61	1.14	.24	.20	2.22	1.91	.47	.19	.07	.05	.11
IN.	.95	.68	1.31	.27	.21	2.56	2.17	.55	.21	.08	.05	.13

CAL YR 1977 TOTAL 154593 MEAN 424 MAX 2880 MIN 39 CFSM .50 IN 6.84  
WTR YR 1978 TOTAL 206423 MEAN 566 MAX 7880 MIN 23 CFSM .67 IN 9.13

## STREAMS TRIBUTARY TO LAKE HURON

303

04152500 TOBACCO RIVER AT BEAVERTON, MI

LOCATION.--Lat 43°52'43", long 84°28'18", in NW¼ Sec.7, T.17 N., R.1 W., Gladwin County, Hydrologic Unit 04080201, on left bank 15 ft (5 m) downstream from bridge on Glidden Road, 1.0 mi (1.6 km) downstream from dam in Beaverton, and 2.0 mi (3.2 km) upstream from Venison Creek.

DRAINAGE AREA.--487 mi<sup>2</sup> (1,261 km<sup>2</sup>).

PERIOD OF RECORD.--July 1948 to current year.

REVISED RECORDS.--MSP 1307: 1948 (M).

GAGE.--Water-stage recorder. Datum of gage is 683.27 ft (208.261 m) National Geodetic Vertical Datum of 1929 (levels by Michigan Department of Natural Resources).

REMARKS.--Records good except those for the winter period, which are poor. Prior to Feb. 21, 1961, regulation at all stages by hydro-electric powerplant 1.0 mi (1.6 km) above station; occasional regulation since. Several observations of water temperature were made during the year.

AVERAGE DISCHARGE.--30 years, 379 ft<sup>3</sup>/s (10.73 m<sup>3</sup>/s), 10.57 in/yr (268 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 7,680 ft<sup>3</sup>/s (217 m<sup>3</sup>/s) July 9, 1957, gage height, 12.95 ft (3.947 m); minimum, 5.6 ft<sup>3</sup>/s (0.16 m<sup>3</sup>/s) July 12, 13, 14, 1959, Aug. 21, 1961; minimum daily, 5.9 ft<sup>3</sup>/s (0.17 m<sup>3</sup>/s) July 12, 13, 1959.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 2,070 ft<sup>3</sup>/s (58.6 m<sup>3</sup>/s) Apr. 1, gage height, 6.79 ft (2.070 m); minimum, 70 ft<sup>3</sup>/s (1.98 m<sup>3</sup>/s) Oct. 17, gage height, 1.50 ft (0.457 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	292	206	840	255	250	230	1790	229	219	177	157	183
2	390	208	1000	250	250	230	1930	240	213	261	161	177
3	397	216	820	250	250	230	1640	240	207	292	164	172
4	305	216	700	250	245	230	1400	207	203	215	166	167
5	255	215	580	250	245	225	1460	181	193	216	165	165
6	244	219	450	250	245	225	1560	192	182	185	162	165
7	240	226	410	250	245	225	1850	217	186	180	159	163
8	284	235	375	250	245	225	1910	229	189	182	157	160
9	437	364	355	250	240	225	1510	257	192	182	157	159
10	562	326	345	250	240	230	986	292	191	181	154	158
11	402	283	340	250	240	230	1090	309	188	179	152	158
12	331	267	340	250	240	240	1020	335	187	175	152	166
13	484	254	340	245	240	255	943	665	186	172	151	256
14	513	244	350	245	240	270	717	1060	188	173	152	434
15	402	243	361	245	240	285	652	956	175	173	150	650
16	282	255	367	245	235	315	487	710	179	172	156	674
17	160	270	383	240	235	340	475	535	280	169	168	405
18	93	263	719	240	235	375	486	353	843	166	174	328
19	176	250	1060	240	235	292	483	356	1040	165	204	584
20	220	271	1100	240	230	322	472	382	480	167	228	487
21	236	458	1010	245	230	399	414	416	212	172	221	351
22	239	560	690	245	230	411	412	366	279	179	187	350
23	308	420	560	245	230	407	366	310	290	207	169	259
24	349	340	480	250	230	481	360	283	245	221	167	229
25	350	265	400	250	230	538	303	259	208	179	167	237
26	217	250	360	250	230	529	283	214	216	170	166	238
27	210	265	325	250	230	506	321	253	231	178	169	253
28	232	320	300	250	230	714	343	245	230	202	189	254
29	239	460	240	250	---	1170	331	237	203	200	339	242
30	233	620	270	250	---	1250	282	231	171	188	243	240
31	214	---	260	250	---	1350	---	222	---	166	187	---
TOTAL	9296	8989	16170	7680	6665	12954	26276	10981	7996	5844	5493	8464
MEAN	300	300	522	248	238	418	876	354	267	189	177	282
MAX	562	620	1100	255	250	1350	1930	1060	1040	292	339	674
MIN	93	206	260	240	230	225	282	181	171	165	150	158
CFSM	.62	.62	1.07	.51	.49	.86	1.80	.73	.55	.39	.36	.58
IN.	.71	.69	1.24	.59	.51	.99	2.01	.84	.61	.45	.42	.65

CAL YR 1977	TOTAL	109757	MEAN 301	MAX 1350	MIN 93	CFSM .62	IN 8.38
WTR YR 1978	TOTAL	126808	MEAN 347	MAX 1930	MIN 93	CFSM .71	IN 9.69

## STREAMS TRIBUTARY TO LAKE HURON

04154000 CHIPPEWA RIVER NEAR MOUNT PLEASANT, MI

LOCATION.--Lat 43°37'32", long 84°42'28", in NW¼ NW¼ sec.8, T.14 N., R.3 W., Isabella County, Hydrologic Unit 04080202, on right bank 12 ft (4 m) downstream from bridge on South Leaton Road, 3.8 mi (6.1 km) northeast of Mount Pleasant, and 36 mi (58 km) upstream from mouth.

DRAINAGE AREA.--416 mi<sup>2</sup> (1,077 km<sup>2</sup>).

PERIOD OF RECORD.--October 1930 to September 1931, October 1932 to current year. Monthly discharge only for some periods published in WSP 1307. Gage-height records for flood seasons collected in this vicinity 1910-27, are contained in reports of U.S. Weather Bureau.

REVISED RECORDS.--WSP 744: Drainage area. WSP 1337: 1931, 1933-40, 1945, 1948-49.

GAGE.--Water-stage recorder. Datum of gage is 710.38 ft (216.524 m) National Geodetic Vertical Datum of 1929 (levels by Michigan Department of Natural Resources). Prior to Oct. 21, 1938, nonrecording gage at site 30 ft (9 m) upstream at present datum.

REMARKS.--Records good except those for the winter period, which are poor. Diurnal fluctuation below 750 ft<sup>3</sup>/s (21.2 m<sup>3</sup>/s) caused by powerplant at Mount Pleasant prior to 1962, occasional regulation at low flow since. Since July 30, 1968, occasional regulation by control structures on lake outlets. Several observations of water temperature were made during the year. National Weather Service gage-height telemark at station.

AVERAGE DISCHARGE.--47 years, 306 ft<sup>3</sup>/s (8.666 m<sup>3</sup>/s), 9.99 in/yr (254 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 4,960 ft<sup>3</sup>/s (140 m<sup>3</sup>/s) Mar. 8, 1946, gage height, 12.78 ft (3.895 m); minimum, 12 ft<sup>3</sup>/s (0.34 m<sup>3</sup>/s) Aug. 18, 1945; minimum daily, 19 ft<sup>3</sup>/s (0.54 m<sup>3</sup>/s) Aug. 16, 1936; minimum gage height, 2.70 ft (0.823 m) Oct. 8, 1966.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 1,450 ft<sup>3</sup>/s (41.1 m<sup>3</sup>/s) Apr. 7, gage height, 6.95 ft (2.118 m), only peak above base of 1,000 ft<sup>3</sup>/s (28.3 m<sup>3</sup>/s); minimum, 126 ft<sup>3</sup>/s (3.57 m<sup>3</sup>/s) Aug. 2, 7; minimum gage height, 3.06 ft (0.933 m) Sept. 10.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	383	281	370	250	240	220	1040	285	188	168	133	170
2	470	284	519	250	240	220	1110	273	184	174	133	164
3	380	284	436	250	240	220	930	265	180	168	139	159
4	351	277	381	250	240	215	1050	253	175	164	133	150
5	339	274	354	250	240	215	1190	248	171	162	130	147
6	309	272	325	255	240	220	1130	248	164	157	129	149
7	282	270	310	255	240	220	1360	241	164	154	128	154
8	325	266	300	260	235	220	1310	242	168	151	131	152
9	412	265	300	260	235	220	1200	253	164	147	166	147
10	400	270	305	260	230	225	1120	251	160	142	157	146
11	396	266	315	260	230	230	1100	244	159	138	145	147
12	408	260	325	260	230	235	1060	261	158	138	139	154
13	399	257	350	255	230	250	938	359	153	139	138	178
14	384	255	320	255	225	270	847	497	146	139	137	204
15	370	253	302	250	220	280	753	542	144	136	133	233
16	360	257	297	250	220	275	661	526	147	135	145	257
17	351	255	310	245	220	270	599	473	157	132	147	254
18	343	254	420	245	220	270	530	420	190	131	144	247
19	340	250	553	245	220	275	497	360	232	134	177	258
20	334	278	556	245	220	286	470	332	249	135	186	271
21	327	321	544	245	220	286	448	329	241	139	173	302
22	322	310	471	245	215	309	427	311	212	141	162	288
23	318	301	439	245	215	330	407	290	188	141	157	262
24	314	300	390	245	215	322	402	274	177	136	152	244
25	308	298	370	240	215	287	391	264	174	134	149	230
26	304	290	350	240	215	257	375	250	178	141	147	220
27	299	290	320	240	220	232	358	236	179	145	149	219
28	294	275	300	240	220	277	340	226	173	140	160	214
29	290	260	280	240	---	483	322	215	170	138	165	213
30	286	280	260	240	---	455	302	209	166	138	169	212
31	282	---	250	240	---	498	---	202	---	133	174	---
TOTAL	10680	8253	11322	7710	6350	8572	22657	9379	5311	4470	4627	6145
MEAN	345	275	365	249	227	277	755	303	177	144	149	205
MAX	470	321	556	260	240	498	1360	542	249	174	186	302
MIN	282	250	250	240	215	215	302	202	144	131	128	146
CFSM	.83	.66	.88	.60	.55	.67	1.82	.73	.43	.35	.36	.49
IN.	.96	.74	1.01	.69	.57	.77	2.03	.84	.47	.40	.41	.55

CAL YR 1977 TOTAL 102265 MEAN 280 MAX 1500 MIN 92 CFSM .67 IN 9.14  
WTR YR 1978 TOTAL 105476 MEAN 289 MAX 1360 MIN 128 CFSM .70 IN 9.43

## STREAMS TRIBUTARY TO LAKE HURON

305

## 04155000 PINE RIVER AT ALMA, MI

LOCATION.--Lat 43°22'46", long 84°39'20", in SW¼ SE¼ sec.34, T.12 N., R.3 W., Gratiot County, Hydrologic Unit 04080202, on right bank 270 ft (32 m) downstream from Superior Street Bridge in Alma, 0.6 mi (1.0 km) downstream from municipal reservoir, and 38 mi (61 km) upstream from mouth.

DRAINAGE AREA.--288 mi<sup>2</sup> (746 km<sup>2</sup>).

PERIOD OF RECORD.--October 1930 to current year. Gage-height records for flood seasons collected in this vicinity 1910-28 are contained in reports of U.S. Weather Bureau.

REVISED RECORDS.--WSP 744: Drainage area. WSP 1307: 1945(M). WSP 1337: 1931, 1932-34(M), 1936, 1939, 1945, 1949.

GAGE.--Water-stage recorder. Datum of gage is 718.37 ft (218.959 m) National Geodetic Vertical Datum of 1929. Prior to Dec. 10, 1930, nonrecording gage at Superior Street Bridge at different datum. Dec. 10, 1930, to June 15, 1938, nonrecording gage at site 70 ft (21 m) downstream from bridge and June 16 to Oct. 25, 1938, nonrecording gage at bridge at present datum.

REMARKS.--Records good except those for the winter period, which are poor. Occasional regulation caused by dam 0.6 mi (1.0 km) above station and by variable backwater from powerplant at St. Louis, 5.2 mi (8.4 km) below station. Since July 1965, about 2.5 ft<sup>3</sup>/s (0.07 m<sup>3</sup>/s) diverted above station for municipal and industrial use; sewage effluent is returned below station. Several observations of water temperature were made during the year.

AVERAGE DISCHARGE.--48 years, 213 ft<sup>3</sup>/s (6.032 m<sup>3</sup>/s), 10.04 in/yr (255 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 4,400 ft<sup>3</sup>/s (125 m<sup>3</sup>/s) Mar. 19, 1948, gage height, 10.81 ft (3.295 m); minimum daily, 0.40 ft<sup>3</sup>/s (0.011 m<sup>3</sup>/s) Sept. 6, 1964, caused by closing dam during construction of waterworks.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 2,630 ft<sup>3</sup>/s (74.5 m<sup>3</sup>/s) Apr. 4, gage height, 8.82 ft (2.688 m); minimum, 60 ft<sup>3</sup>/s (1.699 m<sup>3</sup>/s) Aug. 15; minimum gage height, 0.67 ft (0.204 m) Aug. 15, 16.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	402	163	271	230	130	130	1420	218	131	82	77	88
2	413	160	351	220	135	130	1090	208	128	83	73	78
3	348	166	329	210	135	130	1100	197	119	90	72	73
4	373	165	309	200	135	130	2180	186	118	98	69	71
5	402	174	347	190	135	130	1730	196	116	94	68	69
6	373	188	341	190	135	130	1310	196	112	86	67	69
7	337	173	200	190	135	130	1330	196	106	77	65	68
8	339	165	230	195	140	130	1040	208	108	74	63	78
9	324	161	190	210	140	125	930	213	108	72	62	76
10	296	159	180	220	140	125	858	205	105	67	64	74
11	293	151	130	170	140	120	805	216	101	67	75	73
12	309	146	105	160	140	125	709	234	102	66	94	70
13	319	167	140	160	140	130	632	274	94	67	106	88
14	306	165	210	165	140	150	577	327	95	67	73	107
15	280	163	250	170	140	170	528	363	95	66	62	123
16	268	166	257	155	140	188	464	420	97	68	66	155
17	245	163	277	190	140	212	431	424	102	68	64	184
18	232	160	430	145	135	254	396	391	122	67	68	197
19	194	165	495	145	135	250	374	346	128	66	128	145
20	177	199	516	145	135	281	359	318	138	67	135	144
21	179	198	488	145	135	321	344	292	137	70	149	188
22	184	151	462	145	135	395	338	265	121	77	152	162
23	178	214	463	145	130	521	328	248	104	85	129	171
24	174	246	466	140	130	680	316	235	94	83	104	173
25	170	256	400	140	130	650	288	216	88	81	98	141
26	167	210	350	130	130	545	281	192	93	80	86	126
27	169	185	290	120	130	504	268	179	85	80	84	116
28	171	185	280	115	130	623	254	175	87	77	85	146
29	150	180	280	110	---	885	241	164	90	82	98	104
30	154	180	230	115	---	772	233	155	84	80	136	100
31	162	---	230	125	---	914	---	139	---	79	114	---
TOTAL	4111	5366	9707	5050	3795	9980	21154	7596	3208	2366	2786	3457
MEAN	262	179	313	163	136	322	705	245	107	76.3	89.9	115
MAX	413	256	516	230	140	914	2180	424	138	98	152	197
MIN	154	148	180	110	130	120	233	139	84	66	62	68
CFSM	.91	.62	1.09	.57	.47	1.12	2.45	.85	.37	.27	.31	.40
IN.	1.05	.69	1.25	.65	.49	1.29	2.73	.98	.41	.31	.36	.45

CAL YR 1977 TOTAL 69520 MEAN 190 MAX 825 MIN 14 CFSM .66 IN 8.98  
 WTR YR 1978 TOTAL 82575 MEAN 226 MAX 2180 MIN 62 CFSM .79 IN 10.67



## STREAMS TRIBUTARY TO LAKE HURON

## 04155500 PINE RIVER NEAR MIDLAND, MI

LOCATION.--Lat 43°33'52", long 84°22'09", in SW $\frac{1}{4}$  NW $\frac{1}{4}$  sec.4, T.13 N., R.1 E., Midland County, Hydrologic Unit 04080202, on left bank at downstream side of bridge on Meridian Road, 7.2 mi (11.6 km) southwest of Midland, and 7.8 mi (12.6 km) upstream from Chippewa River.

DRAINAGE AREA.--390 mi<sup>2</sup> (1,010 km<sup>2</sup>), approximately.

PERIOD OF RECORD.--May 1934 to September 1938, February 1948 to current year.

REVISED RECORDS.--WSP 1207: Drainage area. WSP 1307: 1935(M). WSP 1337: 1936-38, 1948-49.

GAGE.--Water-stage recorder. Datum of gage is 623.94 ft (190.177 m) National Geodetic Vertical Datum of 1929. Prior to Sept. 30, 1938, nonrecording gage at same site, at datum 5.55 ft (1.692 m) lower. Feb. 3, 1948, to Dec. 13, 1951, nonrecording gage at present site and datum.

REMARKS.--Records good except those for the winter period, which are poor. Regulation at low and medium flows by hydroelectric power-plant at St. Louis. Some diversion above station for irrigation. Several observations of water temperature were made during the year.

AVERAGE DISCHARGE.--34 years, 296 ft<sup>3</sup>/s (8.383 m<sup>3</sup>/s), 10.31 in/yr (262 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 6,360 ft<sup>3</sup>/s (180 m<sup>3</sup>/s) Mar. 20, 1948, gage height, 10.00 ft (3.048 m), from graph based on gage readings; maximum gage height, 12.08 ft (3.682 m) Feb. 2, 1968, backwater from ice; minimum discharge, not determined.

EXTREMES FOR CURRENT YEAR.--Peak discharges above base of 1,200 ft<sup>3</sup>/s (34.0 m<sup>3</sup>/s) and maximum (\*):

Date	Time	Discharge (ft <sup>3</sup> /s) (m <sup>3</sup> /s)	Gage height (ft) (m)	Date	Time	Discharge (ft <sup>3</sup> /s) (m <sup>3</sup> /s)	Gage height (ft) (m)
Apr. 1	2300	2580 73.1	6.48 1.975	Apr. 5	0800	*3310 93.7	*7.21 2.198

Minimum discharge, 12 ft<sup>3</sup>/s (0.34 m<sup>3</sup>/s) Sept. 9, 10, gage height, 1.96 ft (0.597 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	589	211	277	175	145	135	2410	246	159	104	85	147
2	926	208	300	170	145	135	2080	245	114	107	81	136
3	694	162	300	165	145	135	1510	231	137	107	79	125
4	476	198	285	165	145	135	2020	217	111	105	73	115
5	505	182	260	160	145	140	2980	191	115	111	70	104
6	527	158	250	160	145	140	2110	210	118	113	67	56
7	433	220	240	160	145	140	2070	193	134	109	66	21
8	437	209	235	155	145	140	1650	212	131	105	77	15
9	522	178	230	155	145	140	1250	239	111	106	80	13
10	478	210	225	155	145	145	1180	243	117	103	46	60
11	427	193	220	150	140	150	1130	212	108	96	38	68
12	437	214	220	150	140	160	980	273	111	74	38	84
13	416	127	220	150	140	170	854	334	141	60	37	62
14	405	160	220	150	140	180	763	413	98	65	84	77
15	383	215	220	150	140	200	686	475	100	66	137	119
16	361	156	230	150	140	220	627	489	102	66	102	133
17	341	174	240	150	140	240	562	512	104	68	77	135
18	263	172	250	150	140	260	488	491	110	67	65	146
19	376	166	250	150	140	300	476	455	110	68	78	286
20	293	142	245	145	140	350	455	319	153	69	148	118
21	200	223	235	145	140	420	434	319	170	81	150	122
22	190	204	230	145	140	500	372	288	111	78	160	285
23	232	198	225	145	140	600	378	232	115	81	198	140
24	211	210	220	145	140	700	378	230	115	87	134	119
25	228	252	210	145	140	760	358	215	113	89	73	207
26	206	280	205	145	135	800	319	216	119	94	93	130
27	174	220	200	145	135	900	305	204	161	105	134	125
28	194	200	190	145	135	1000	291	131	100	95	123	68
29	209	220	190	145	---	1720	273	142	94	90	60	163
30	193	255	180	145	---	1630	253	134	95	90	24	136
31	150	---	180	145	---	1610	---	144	---	88	89	---
TOTAL	11476	5917	7182	4710	3955	14255	29642	8455	3577	2747	2766	3515
MEAN	370	197	232	152	141	460	988	273	119	88.6	89.2	117
MAX	926	280	300	175	145	1720	2980	512	170	113	198	286
MIN	150	127	180	145	135	135	253	131	94	60	24	13
CFSM	.95	.51	.60	.39	.36	1.18	2.53	.70	.31	.23	.23	.30
IN.	1.09	.56	.69	.45	.38	1.36	2.83	.81	.34	.26	.26	.34

CAL YR 1977	TOTAL	78161	MEAN	214	MAX	1960	MIN	50	CFSM	.55	IN	7.46
WTR YR 1978	TOTAL	98197	MEAN	269	MAX	2980	MIN	13	CFSM	.69	IN	9.37

## 04156000 TITTABAWASSEE RIVER AT MIDLAND, MI

LOCATION.--Lat 43°35'43", long 84°14'08", in NW¼ NE¼ sec.28, T.14 N., R.2 E., Midland County, Hydrologic Unit 04080201, on right bank 2,000 ft (610 m) downstream from dam at Dow Chemical Co. powerplant in Midland, 0.7 mi (1.1 km) upstream from Bullock Creek, 1.4 mi (2.3 km) downstream from Chippewa River and 23 mi (37 km) upstream from mouth.

DRAINAGE AREA.--2,400 mi<sup>2</sup> (6,200 km<sup>2</sup>), approximately.

PERIOD OF RECORD.--March 1936 to current year. Gage-height records for flood seasons collected in this vicinity 1910-26, 1928, and since 1946 are contained in reports of U.S. Weather Bureau.

REVISED RECORDS.--WSP 1045: 1945. WSP 1144: 1948.

GAGE.--Water-stage recorder. Datum of gage is 580.28 ft (176.869 m) National Geodetic Vertical Datum of 1929. Prior to Sept. 30, 1955, at datum 10.00 ft (3.048 m) higher.

REMARKS.--Records good except those for the winter period, which are poor. Water is diverted from river a short distance above station for industrial use. Small part returned to river at gage, small part returned to river 0.25 mi (0.4 km) below station, remainder returned 1 mi (1.6 km) below. Extremes and daily discharges not adjusted for diversion. Prior to May 20, 1970, discharge below 4,000 ft<sup>3</sup>/s (113 m<sup>3</sup>/s) regulated by dam 2,000 ft (610 m) above station; fixed crest dam since. Several observations of water temperature were made during the year. National Weather Service gage-height telemark at station.

AVERAGE DISCHARGE.--42 years, 1,658 ft<sup>3</sup>/s (46.95 m<sup>3</sup>/s), 9.38 in/yr (238 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 34,000 ft<sup>3</sup>/s (963 m<sup>3</sup>/s) Mar. 21, 1948, gage height, 29.50 ft (8.992 m); minimum, 39 ft<sup>3</sup>/s (1.10 m<sup>3</sup>/s) Oct. 12, 1942; minimum daily, 111 ft<sup>3</sup>/s (3.14 m<sup>3</sup>/s) Aug. 21, 1949; minimum gage height, 9.04 ft (2.755 m) Aug. 19, 1954, caused by bridge construction above station.

EXTREMES OUTSIDE PERIOD OF RECORD.--Maximum stage known since at least 1907, 29.7 ft (9.05 m) Mar. 28, 1916, discharge, 34,800 ft<sup>3</sup>/s (986 m<sup>3</sup>/s), from information by U.S. Weather Bureau.

EXTREMES FOR CURRENT YEAR.--Peak discharges above base of 7,000 ft<sup>3</sup>/s (198 m<sup>3</sup>/s) and maximum (\*):

Date	Time	Discharge (ft <sup>3</sup> /s) (m <sup>3</sup> /s)	Gage height (ft) (m)	Date	Time	Discharge (ft <sup>3</sup> /s) (m <sup>3</sup> /s)	Gage height (ft) (m)
Apr. 2	1800	*11900 337	*22.14 6.748	Apr. 8	1130	10800 306	21.23 6.471
Apr. 5	1900	10100 286	20.68 6.303				

Minimum discharge, 200 ft<sup>3</sup>/s (5.66 m<sup>3</sup>/s) Sept. 8, gage height, 9.43 ft (2.874 m); minimum daily, 253 ft<sup>3</sup>/s (7.16 m<sup>3</sup>/s) Sept. 10.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1040	994	2060	840	1400	1000	9500	927	815	473	442	745
2	1920	970	3810	880	1200	960	11700	977	690	473	422	481
3	2330	930	4370	1500	1250	1050	10500	1010	490	723	435	408
4	1680	970	2010	1750	840	900	8530	990	366	477	432	388
5	1700	620	2010	1650	640	450	9700	949	440	702	319	492
6	1800	515	2130	2000	900	840	9680	726	547	574	287	436
7	1670	1080	1700	1200	1100	1300	10200	630	511	544	396	372
8	1110	1160	1800	700	1200	1250	10700	817	586	415	377	379
9	1050	1140	1600	900	1250	1200	8910	928	605	371	484	289
10	1760	1180	800	2200	1100	1050	6350	1070	469	498	436	253
11	2210	962	520	2000	740	600	5630	1120	381	503	409	756
12	2190	630	1200	1700	580	450	5730	1130	472	431	315	682
13	2130	490	2410	1300	780	1100	5160	1610	481	425	279	952
14	2300	836	2120	1000	940	1840	4620	2410	433	391	373	975
15	1290	978	1940	740	1300	1930	4280	2850	471	405	450	675
16	881	881	2000	1050	1500	1630	4000	3110	476	325	459	636
17	1100	909	1270	1500	1600	1850	3790	3280	445	326	414	663
18	1120	1080	1440	1350	1200	1100	3680	3370	1200	454	402	2490
19	1270	595	4070	1150	580	800	3310	2320	2620	422	430	2650
20	1170	530	5330	1300	540	1750	3220	1310	2720	417	430	1610
21	874	994	5040	880	860	2560	2580	1010	1300	480	620	1570
22	655	1500	4400	660	1250	2760	1870	1200	867	357	565	1400
23	690	1960	4100	1050	1100	3510	1230	1450	734	319	597	797
24	1000	1150	3980	1200	1200	4380	1510	1340	523	454	558	434
25	1000	1410	2250	1100	950	4760	1750	1390	475	534	436	609
26	1000	1000	1300	1250	500	3840	1620	1350	638	487	350	768
27	978	430	2000	1150	660	2930	1490	725	645	643	410	625
28	785	1000	2450	1200	1100	3910	1310	555	575	550	517	744
29	630	1400	2500	800	---	6030	1030	537	541	364	642	523
30	625	1530	2520	1100	---	7360	799	618	533	303	814	457
31	923	---	1700	1400	---	7670	---	720	---	444	643	---
TOTAL	40881	29824	76830	38500	28260	72760	154379	42429	22049	14284	14143	24259
MEAN	1319	994	2478	1242	1009	2347	5146	1369	735	461	456	809
MAX	2330	1960	5330	2200	1600	7670	11700	3370	2720	723	814	2650
MIN	625	430	520	660	500	450	799	537	366	303	279	253
+	22.5	26.6	14.1	21.5	11.0	8.9	28.9	26.6	21.5	14.7	15.5	36.4
MEAN†	1341	1021	2492	1264	1020	2356	5175	1396	756	476	472	845
CFSM†	.56	.43	1.04	.53	.42	.98	2.16	.58	.32	.20	.20	.35
IN†	.64	.47	1.20	.61	.44	1.13	2.41	.67	.35	.23	.23	.39

CAL YR 1977 TOTAL 407273 MEAN 1116 MAX 5330 MIN 209 MEAN† 1144 CFSM† .48 IN† 6.45  
WTR YR 1978 TOTAL 558598 MEAN 1530 MAX 11700 MIN 253 MEAN† 1551 CFSM† .65 IN† 8.77

+Diversion in cubic feet per second, for industrial use; furnished by Dow Chemical Co.

†Adjusted for diversion made by Dow Chemical Co.

## STREAMS TRIBUTARY TO LAKE HURON

04157000 SAGINAW RIVER AT SAGINAW, MI  
(National stream-quality accounting network station)

LOCATION.--Lat 43°24'46", long 83°57'47", in NW¼ SE¼ sec.26, T.12 N., R.4 E., Saginaw County, Hydrologic Unit 04080206, on right bank 1,000 ft (305 m) downstream from bridge on Rust Avenue in Saginaw, 1.9 mi (3.1 km) downstream from Tittabawassee River and 20.3 mi (32.7 km) upstream from mouth. Water quality sampling site at downstream side of bridge on Rust Avenue. Water quality monitor located 1,000 ft (305 m) downstream on downstream side of bridge on Court Street.

DRAINAGE AREA.--6,060 mi<sup>2</sup> (15,700 km<sup>2</sup>), approximately.

## WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--1904, 1908-9, 1912-13, 1916, 1918-19, 1929-30, and 1942 (flood discharge for certain periods only) in WSP 1084: December 1942 to current year (high-water periods only); no high water 1944, 1949, 1953, 1955, 1958, 1961, 1963, 1964, 1966. Gage-height records for flood seasons collected in this vicinity 1910-20, and for entire years since 1921 are contained in reports of U.S. Weather Bureau.

GAGE.--Water-stage recorder. Datum of gage is 565.11 ft (172.246 m), International Great Lakes datum. Prior to Oct. 1, 1972, non-recording gage at site 1.9 mi (3.1 km) downstream at same datum. Auxiliary water-stage recorder on right bank near Alpin Beach, 19.9 mi (32.0 km) downstream.

REMARKS.--Water-discharge records good. Considerable diversion through metropolitan area of Saginaw. National Weather Service gage-height telemark at station.

COOPERATION.--Auxiliary gage-height record furnished by NOAA-National Ocean Survey.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 68,000 ft<sup>3</sup>/s (1,930 m<sup>3</sup>/s) Mar. 30, 1904, gage height, 24.9 ft (7.59 m), site then in use.

EXTREMES FOR CURRENT YEAR.--Maximum daily discharge, 28,900 ft<sup>3</sup>/s (818 m<sup>3</sup>/s) Apr. 3; maximum daily gage height, 17.67 ft (5.386 m) Apr. 3.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1						---	25800					
2						---	26600					
3						---	28900					
4						---	28000					
5						---	26500					
6						---	26700					
7						---	26600					
8						---	25200					
9						---	24500					
10						---	21700					
11						---	17700					
12						---	14700					
13						---	13200					
14						---	11200					
15						---	10600					
16						---	---					
17						---	---					
18						---	---					
19						---	---					
20						---	---					
21						11100	---					
22						11700	---					
23						14100	---					
24						18100	---					
25						20300	---					
26						23000	---					
27						22500	---					
28						20900	---					
29						21700	---					
30						23800	---					
31						25000	---					

04157000 SAGINAW RIVER AT SAGINAW, MI--CONTINUED

## WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1975 to current year.

PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE: November 1974 to current year.

WATER TEMPERATURES: November 1974 to current year.

INSTRUMENTATION.--Water-quality monitor since Nov. 6, 1976.

REMARKS.--Interruptions in the daily record were due to malfunctions of the instrument. Instantaneous water-discharge measurements are made at times of monthly sampling.

EXTREMES FOR PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE (water years 1975 and 1977): Maximum recorded, 1,230 micromhos Jan. 5, 1977; minimum recorded, 224 micromhos Mar. 13, 1977.

WATER TEMPERATURES (water years 1975-77): Maximum, 30.0°C July 10, 14, 20, 1977; minimum, 0.0°C on many days during winter periods.

## WATER QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DATE	TIME	STREAM- FLOW, INSTAN- TANEOUS (CFS)	SPF- CIFIC CON- DUCT- ANCE (MICRO- MHOS)	PH (UNITS)	TEMPER- ATURE (DEG C)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION)	COI I- FORM, FECAL. 0.7 UM-MF (COLS./ 100 ML)	STREP- TOCOCCI FECAL. KF AGAR (COLS. PER 100 ML)	HARD- NESS (MG/L AS CAC03)	HARD- NESS, NONCAR- BONATE (MG/L CAC03)
OCT											
07...	1020	5120	731	8.1	11.0	8.2	74	K400	470	320	130
NOV											
11...	0945	3500	821	8.1	9.0	8.0	70	360	5100	320	120
DEC											
09...	1330	--	775	8.1	.0	10.3	72	150	490	330	94
JAN											
13...	1230	2400	805	7.9	.0	--	--	170	94	330	110
FEB											
09...	1230	1670	784	7.8	.0	9.7	67	K140	72	310	98
MAR											
07...	1430	2000	966	7.8	.0	10.1	69	110	120	340	110
APR											
05...	1445	25500	397	7.8	5.0	11.8	93	--	4000	180	65
MAY											
10...	1315	1470	726	8.2	13.5	9.0	114	86	62	260	96
JUN											
07...	1400	722	804	8.3	22.0	8.0	93	40	K20	300	96
JUL											
18...	1345	752	826	8.5	24.0	12.0	69	72	K13	270	83
AUG											
16...	1015	2900	913	8.6	25.5	7.1	88	K4500	E3400	260	79
SEP											
14...	1315	2920	704	8.1	18.5	5.6	60	1700	960	240	76

K--Results based on colony count outside the acceptable range (non-Ideal colony count)

E--Estimated value

DATE	CALCIUM DIS- SOLVED (MG/L AS CA)	MAGNE- SIUM, DIS- SOLVED (MG/L AS MG)	SODIUM, DIS- SOLVED (MG/L AS NA)	SODIUM AD- SORP- TION RATIO	SODIUM PERCENT	POTAS- SIUM, DIS- SOLVED (MG/L AS K)	BICAR- BONATE (MG/L AS HCO3)	CAR- BONATE (MG/L AS CO3)	ALKA- LINITY (MG/L AS CAC03)	CARRON DIOXIDE DIS- SOLVED (MG/L AS CO2)	SULFATE DIS- SOLVED (MG/L AS SO4)
OCT											
07...	88	24	25	.6	14	4.1	230	0	190	2.9	73
NOV											
11...	86	25	48	1.2	24	3.8	250	0	205	3.2	67
DEC											
09...	90	26	30	.7	16	3.7	290	0	240	3.7	71
JAN											
13...	88	26	40	1.0	21	3.5	270	0	220	5.4	82
FEB											
09...	85	24	39	1.0	21	2.8	260	0	210	6.6	74
MAR											
07...	92	26	60	1.4	28	3.8	280	0	230	7.1	76
APR											
05...	50	14	10	.3	10	3.2	140	0	115	3.6	42
MAY											
10...	74	18	38	1.0	24	2.8	200	0	164	2.0	64
JUN											
07...	81	24	44	1.1	24	3.3	250	0	210	2.0	63
JUL											
18...	69	24	60	1.6	32	3.9	220	4	187	1.2	63
AUG											
16...	65	24	75	2.0	38	4.0	210	6	182	.9	66
SEP											
14...	60	22	48	1.3	30	4.5	200	0	164	2.5	56

STREAMS TRIBUTARY TO LAKE HURON  
04157000 SAGINAW RIVER AT SAGINAW, MI--CONTINUED

WATER-QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978--CONTINUED

DATE	CHLORIDE, DIS- SOLVED (MG/L AS CL)	FLUORIDE, DIS- SOLVED (MG/L AS F)	SILICA, DIS- SOLVED (MG/L AS SiO2)	SOLIDS, RESIDUE AT 180 DEG. C DIS- SOLVED (MG/L)	SOLIDS, SUM OF CONSTI- TUENTS, DIS- SOLVED (MG/L)	SOLIDS, DIS- SOLVED (TONS PER DAY)	NITRO- GEN, NO2+NO3 TOTAL (MG/L AS N)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N)	NITRO- GEN, ORGANIC TOTAL (MG/L AS N)	NITRO- GEN,AM- MONIA + ORGANIC TOTAL (MG/L AS N)
OCT 07...	61	.2	8.4	455	397	6290	4.6	.25	--	--
NOV 11...	99	.2	5.4	520	458	4910	.89	.49	--	--
DEC 09...	64	.2	7.2	461	435	--	3.0	.48	--	--
JAN 13...	88	.2	8.4	497	469	3220	1.6	.71	--	--
FEB 09...	83	.1	9.2	478	445	2160	.91	.89	.91	1.8
MAR 07...	120	.2	9.3	580	525	3130	.89	1.1	.90	2.0
APR 05...	26	.1	5.4	273	220	18800	2.4	.18	1.0	1.2
MAY 10...	95	.1	1.7	440	392	1750	.38	.25	.85	1.1
JUN 07...	98	.2	3.3	519	440	1010	.76	.34	1.3	1.6
JUL 18...	120	.3	1.0	532	454	1080	.52	.38	1.5	1.9
AUG 16...	130	.4	1.8	513	476	4020	.71	.48	1.5	2.0
SEP 14...	94	.3	4.3	433	388	3410	.64	.59	.91	1.5

DATE	NITRO- GEN, NH4 + ORG. SUSP. TOTAL (MG/L AS N)	NITRO- GEN, AM- MONIA + ORGANIC DIS. (MG/L AS N)	NITRO- GEN, TOTAL (MG/L AS N)	NITRO- GEN, TOTAL (MG/L AS NO3)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, DIS- SOLVED (MG/L AS P)	CARRON. ORGANIC TOTAL (MG/L AS C)	SEDI- MENT, SUS- PENDE (MG/L)	SEDI- MENT DIS- CHARGE, SUS- PENDE (T/DAY)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM
OCT 07...	--	1.1	--	--	.19	.08	--	50	691	100
NOV 11...	--	1.0	--	--	.16	.08	--	25	236	100
DEC 09...	--	1.5	--	--	.21	.07	11	72	--	100
JAN 13...	--	.85	--	--	.18	.08	--	1	6.5	100
FEB 09...	.10	1.7	2.7	12	.13	.08	12	4	18	100
MAR 07...	.20	1.8	2.9	13	.15	.11	1.8	4	22	100
APR 05...	.30	.90	3.6	16	.16	.28	--	95	6540	100
MAY 10...	.32	.78	1.5	6.6	.09	.03	12	10	40	100
JUN 07...	.63	.97	2.4	10	.19	.06	--	28	55	100
JUL 18...	1.0	.86	2.4	11	.29	.04	--	38	77	100
AUG 16...	1.1	.87	2.7	12	.39	.15	8.9	43	337	100
SEP 14...	.20	1.3	2.1	9.5	.29	.15	7.4	26	205	100



## STREAMS TRIBUTARY TO LAKE HURON

311

04157000 SAGINAW RIVER AT SAGINAW, MI--CONTINUED

## WATER-QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978--CONTINUED

DATE	TIME	ARSENIC TOTAL (UG/L AS AS)	ARSENIC DIS- SOLVED (UG/L AS AS)	BARIUM, TOTAL RECOV- ERABLE (UG/L AS BA)	BARIUM, DIS- SOLVED (UG/L AS BA)	CADMIUM TOTAL RECOV- ERABLE (UG/L AS CD)	CADMIUM DIS- SOLVED (UG/L AS CD)	CHRO- MIUM, TOTAL RECOV- ERABLE (UG/L AS CR)	CHRO- MIUM, DIS- SOLVED (UG/L AS CR)	COBALT, TOTAL RECOV- ERABLE (UG/L AS CO)
OCT 07...	1020	0	0	0	0	0	0	10	1	0
JAN 13...	1230	--	--	200	200	2	--	<10	--	0
APR 05...	1445	2	2	0	0	1	0	10	1	0
JUL 18...	1345	4	3	0	0	0	0	10	1	0

DATE	COBALT, DIS- SOLVED (UG/L AS CO)	COPPER, TOTAL RECOV- ERABLE (UG/L AS CU)	COPPER, DIS- SOLVED (UG/L AS CU)	IRON, TOTAL RECOV- ERABLE (UG/L AS FE)	IRON, DIS- SOLVED (UG/L AS FE)	LEAD, TOTAL RECOV- ERABLE (UG/L AS PR)	LEAD, DIS- SOLVED (UG/L AS PR)	MANGA- NESE, TOTAL RECOV- ERABLE (UG/L AS MN)	MANGA- NESE, DIS- SOLVED (UG/L AS MN)	MERCURY TOTAL RECOV- ERABLE (UG/L AS HG)
OCT 07...	0	3	2	1600	30	14	10	80	20	<.5
JAN 13...	--	15	--	1600	0	9	--	90	--	<.5
APR 05...	0	11	3	3400	240	19	0	70	20	<.5
JUL 18...	0	11	3	1100	10	9	0	110	0	.5

DATE	MERCURY DIS- SOLVED (UG/L AS HG)	SELE- NIUM, TOTAL (UG/L AS SE)	SELE- NIUM, DIS- SOLVED (UG/L AS SE)	SILVER, TOTAL RECOV- ERABLE (UG/L AS AG)	SILVER, DIS- SOLVED (UG/L AS AG)	ZINC, TOTAL RECOV- ERABLE (UG/L AS ZN)	ZINC, DIS- SOLVED (UG/L AS ZN)	CARRON. ORGANIC DIS- SOLVED (MG/L AS C)	CARRON. ORGANIC SUS- PENDED TOTAL (MG/L AS C)
OCT 07...	<.5	0	0	0	0	20	10	19	--
JAN 13...	<.5	--	--	0	--	60	10	7.8	.2
APR 05...	<.5	0	0	0	0	30	0	6.9	2.7
JUL 18...	.5	0	0	0	0	40	0	9.3	2.6

QUALITATIVE AND ASSOCIATED QUANTITATIVE ANALYSES OF BIOLOGICAL DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
PFRIPHYTON

DATE	TIME	LENGTH OF EXPO- SURE (DAYS)	PFRIPHYTON BIOMASS ASH WEIGHT G/SQ M	PERI- PHYTON BIOMASS TOTAL DRY WEIGHT G/SQ M	CHLOR-A PERI- PHYTON CHROMO- GRAPHIC FLUOROM (MG/M2)	CHLOR-B PERI- PHYTON CHROMO- GRAPHIC FLUOROM (MG/M2)
JAN 13...	1230	35	.000	.079	.000	.000
AUG 16...	1015	29	9.69	12.0	45.5	11.1

STREAMS TRIBUTARY TO LAKE HURON  
04157000 SAGINAW RIVER AT SAGINAW, MI--CONTINUED

SPECIFIC CONDUCTANCE (MICROMHOS/CM AT 25 DEG. C), WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
	OCTOBER			NOVEMBER			DECEMBER			JANUARY		
1	824	811	817	---	---	---	796	762	781			
2	815	809	811	---	---	---	781	753	771			
3	800	790	795	---	---	---	754	736	744			
4	781	743	762	---	---	---	723	714	715			
5	740	737	738	---	---	---	708	692	701			
6	731	726	728	---	---	---	686	665	677			
7	753	715	726	---	---	---	655	632	650			
8	747	695	718	---	---	---	628	621	626			
9	---	---	---	---	---	---	620	599	606			
10	734	710	722	---	---	---	---	---	---			
11	716	677	695	---	---	---	---	---	---			
12	689	658	674	---	---	---	---	---	---			
13	662	635	648	---	---	---	---	---	---			
14	620	608	613	---	---	---	---	---	---			
15	---	---	---	---	---	---	---	---	---			
16	---	---	---	---	---	---	---	---	---			
17	---	---	---	---	---	---	---	---	---			
18	---	---	---	---	---	---	---	---	---			
19	---	---	---	---	---	---	---	---	---			
20	---	---	---	---	---	---	---	---	---			
21	---	---	---	---	---	---	---	---	---			
22	---	---	---	---	---	---	---	---	---			
23	---	---	---	---	---	---	---	---	---			
24	---	---	---	---	---	---	---	---	---			
25	---	---	---	---	---	---	---	---	---			
26	---	---	---	---	---	---	---	---	---			
27	---	---	---	---	---	---	---	---	---			
28	---	---	---	864	855	861	---	---	---			
29	---	---	---	871	833	853	---	---	---			
30	---	---	---	833	809	814	---	---	---			
31	---	---	---	---	---	---	---	---	---			

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
	FEBRUARY			MARCH			APRIL			MAY		
1	---	---	---	1020	1000	1020	---	---	---	714	683	701
2	---	---	---	1020	999	1010	---	---	---	734	694	712
3	---	---	---	1020	1000	1010	---	---	---	726	712	719
4	---	---	---	1010	1000	1010	---	---	---	754	725	731
5	---	---	---	1010	991	1000	522	411	482	767	717	750
6	---	---	---	1000	993	999	504	492	499	778	748	757
7	---	---	---	1010	1000	1000	480	460	471	803	628	719
8	---	---	---	---	---	---	448	402	425	816	675	738
9	---	---	---	---	---	---	396	381	385	824	752	793
10	994	979	991	---	---	---	410	379	394	805	760	789
11	995	975	991	---	---	---	453	411	433	793	565	674
12	1000	990	993	---	---	---	471	449	459	672	580	630
13	1000	986	995	---	---	---	489	471	481	680	641	664
14	1030	961	1000	---	---	---	515	487	501	677	552	635
15	1020	1010	1010	---	---	---	537	513	527	636	550	598
16	1040	1020	1020	---	---	---	551	510	528	583	503	544
17	1040	1030	1030	---	---	---	565	516	537	608	544	573
18	1040	1030	1040	---	---	---	540	524	530	609	570	590
19	1040	993	1030	---	---	---	555	528	539	629	571	596
20	1040	1030	1030	---	---	---	573	530	556	660	600	631
21	1040	1020	1040	---	---	---	581	553	564	667	667	667
22	1040	979	1040	---	---	---	609	561	591	673	663	671
23	1040	1020	1040	---	---	---	641	599	620	680	650	668
24	1040	1010	1030	---	---	---	663	631	647	677	667	667
25	1030	1010	1020	---	---	---	674	659	668	683	663	678
26	1030	1010	1020	---	---	---	670	652	664	710	680	691
27	1020	1000	1010	---	---	---	670	657	664	768	724	752
28	1030	996	1020	---	---	---	683	659	665	771	729	740
29	---	---	---	---	---	---	697	646	673	743	703	728
30	---	---	---	---	---	---	698	664	689	768	678	710
31	---	---	---	---	---	---	---	---	---	782	722	757
MONTH										824	503	686

04157000 SAGINAW RIVER AT SAGINAW, MI--CONTINUED  
 SPECIFIC CONDUCTANCE (MICROMHOS/CM AT 25 DEG. C), WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
	JUNE			JULY			AUGUST			SEPTEMBER		
1	767	707	746	---	---	---	889	853	872	908	746	845
2	741	721	730	---	---	---	925	877	901	861	798	827
3	746	696	725	---	---	---	936	910	926	865	828	842
4	740	694	719	---	---	---	931	895	913	930	827	867
5	750	722	742	---	---	---	896	868	880	950	874	916
6	780	760	774	---	---	---	865	841	853	994	921	965
7	---	---	---	---	---	---	826	818	824	1010	957	977
8	---	---	---	---	---	---	815	807	810	967	894	936
9	---	---	---	---	---	---	808	800	805	974	893	924
10	---	---	---	---	---	---	805	789	798	955	850	914
11	---	---	---	---	---	---	886	798	835	944	863	890
12	---	---	---	---	---	---	900	825	866	1000	878	930
13	---	---	---	---	---	---	---	---	---	951	827	889
14	---	---	---	---	---	---	---	---	---	900	718	795
15	---	---	---	---	---	---	---	---	---	833	755	777
16	---	---	---	---	---	---	---	---	---	842	821	832
17	---	---	---	---	---	---	905	885	896	874	839	859
18	---	---	---	1020	831	932	926	884	905	887	862	873
19	---	---	---	1050	1010	1040	920	873	903	867	760	819
20	---	---	---	1050	1040	1050	951	908	925	859	748	832
21	---	---	---	1050	1030	1040	946	856	893	861	844	853
22	---	---	---	1020	1000	1010	978	885	940	860	844	852
23	---	---	---	988	961	974	984	881	946	857	828	845
24	---	---	---	961	950	954	930	886	904	853	834	844
25	---	---	---	978	938	958	948	843	911	853	831	840
26	---	---	---	987	959	972	866	821	843	877	844	862
27	---	---	---	980	972	976	880	852	863	887	864	881
28	---	---	---	953	909	934	932	867	896	878	864	871
29	---	---	---	898	878	886	959	884	919	858	842	853
30	---	---	---	867	859	863	997	964	982	832	819	824
31	---	---	---	872	852	859	1000	816	927	---	---	---
MONTH										1010	718	868

## TEMPERATURE (DEG. C) OF WATER, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
	OCTOBER			NOVEMBER			DECEMBER			JANUARY		
1	16.0	14.5	15.5	---	---	---	1.5	.0	1.0	.0	.0	.0
2	14.5	13.0	13.5	---	---	---	1.5	1.0	1.5	.0	.0	.0
3	13.5	12.5	13.0	---	---	---	1.0	.5	1.0	.0	.0	.0
4	14.0	12.5	13.0	---	---	---	.5	.0	.0	.0	.0	.0
5	14.0	13.0	13.0	---	---	---	.0	.0	.0	.0	.0	.0
6	13.0	12.5	12.5	---	---	---	.0	.0	.0	.0	.0	.0
7	12.5	11.5	12.0	---	---	---	.0	.0	.0	.0	.0	.0
8	12.5	11.5	12.0	---	---	---	.0	.0	.0	.0	.0	.0
9	12.5	11.5	12.0	---	---	---	.0	.0	.0	.0	.0	.0
10	11.5	10.5	11.0	---	---	---	.0	.0	.0	.0	.0	.0
11	11.5	10.5	11.0	---	---	---	.0	.0	.0	.0	.0	.0
12	10.5	10.0	10.0	---	---	---	.0	.0	.0	.0	.0	.0
13	10.5	9.0	10.0	---	---	---	.0	.0	.0	.0	.0	.0
14	10.0	9.0	9.5	---	---	---	.0	.0	.0	.0	.0	.0
15	---	---	---	---	---	---	.0	.0	.0	.0	.0	.0
16	---	---	---	---	---	---	.0	.0	.0	.0	.0	.0
17	---	---	---	---	---	---	.0	.0	.0	.0	.0	.0
18	---	---	---	---	---	---	1.0	.0	.5	.0	.0	.0
19	---	---	---	---	---	---	1.0	1.0	1.0	.0	.0	.0
20	---	---	---	---	---	---	1.0	.0	1.0	.0	.0	.0
21	---	---	---	---	---	---	.0	.0	.0	.0	.0	.0
22	---	---	---	---	---	---	.0	.0	.0	.0	.0	.0
23	---	---	---	---	---	---	.5	.0	.0	.0	.0	.0
24	---	---	---	---	---	---	.5	.0	.0	.0	.0	.0
25	---	---	---	---	---	---	.5	.0	.0	.0	.0	.0
26	---	---	---	---	---	---	.0	.0	.0	.0	.0	.0
27	---	---	---	---	---	---	.0	.0	.0	.0	.0	.0
28	---	---	---	.5	.0	.0	.0	.0	.0	.0	.0	.0
29	---	---	---	.0	.0	.0	.0	.0	.0	.0	.0	.0
30	---	---	---	.5	.0	.0	.0	.0	.0	.0	.0	.0
31	---	---	---	---	---	---	.0	.0	.0	.0	.0	.0
MONTH							1.5	.0	.0	.0	.0	.0

STREAMS TRIBUTARY TO LAKE HURON  
04157000 SAGINAW RIVER AT SAGINAW, MI--CONTINUED

TEMPERATURE (DEG. C) OF WATER, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
FEBRUARY			MARCH			APRIL			MAY			
1	.0	.0	.0	.0	.0	.0	3.5	1.0	3.0	13.0	12.5	12.5
2	.0	.0	.0	.0	.0	.0	3.0	1.0	2.0	12.5	11.5	12.0
3	.0	.0	.0	.0	.0	.0	2.5	1.0	2.0	14.0	12.0	13.0
4	.0	.0	.0	.0	.0	.0	3.0	2.5	2.5	13.5	12.5	13.0
5	.0	.0	.0	.0	.0	.0	4.0	3.0	3.5	12.5	10.5	11.5
6	.0	.0	.0	.0	.0	.0	4.0	4.0	4.0	11.0	10.0	10.5
7	.0	.0	.0	.0	.0	.0	6.0	4.0	5.0	13.0	11.0	12.0
8	.0	.0	.0	.0	.0	.0	6.0	5.0	5.5	14.0	13.0	13.5
9	.0	.0	.0	.0	.0	.0	5.5	5.0	5.0	14.0	13.0	13.5
10	.0	.0	.0	.0	.0	.0	6.0	5.0	5.5	14.0	12.5	13.0
11	.0	.0	.0	.0	.0	.0	7.0	6.0	6.5	14.5	14.0	14.0
12	.0	.0	.0	.0	.0	.0	7.5	5.5	6.5	15.0	13.5	14.5
13	.0	.0	.0	.0	.0	.0	7.5	6.5	7.0	15.0	14.5	15.0
14	.0	.0	.0	.0	.0	.0	7.0	6.0	6.5	15.0	14.5	14.5
15	.0	.0	.0	.0	.0	.0	7.0	6.0	7.0	14.0	13.5	13.5
16	.0	.0	.0	.0	.0	.0	8.0	6.0	7.0	14.5	13.5	13.5
17	.0	.0	.0	.0	.0	.0	8.5	7.0	7.5	16.0	14.0	15.0
18	.0	.0	.0	.0	.0	.0	8.0	6.5	7.5	18.5	15.0	17.0
19	.0	.0	.0	.5	.0	.0	8.0	7.0	7.5	21.0	17.5	19.0
20	.0	.0	.0	1.0	.0	.5	7.5	6.5	7.0	21.0	19.5	20.0
21	.0	.0	.0	1.0	.0	.5	8.0	6.0	7.0	20.0	18.0	19.0
22	.0	.0	.0	.0	.0	.0	10.0	7.0	8.5	19.0	17.0	18.0
23	.0	.0	.0	1.0	.0	.0	10.0	8.5	9.0	19.0	17.5	18.5
24	.0	.0	.0	.0	.0	.0	10.0	9.0	9.0	20.5	18.5	19.0
25	.0	.0	.0	.0	.0	.0	10.5	8.5	10.0	21.5	19.5	20.5
26	.0	.0	.0	.0	.0	.0	12.0	10.0	10.5	22.5	20.5	21.5
27	.0	.0	.0	.0	.0	.0	13.0	11.5	12.0	24.0	21.0	23.0
28	.0	.0	.0	1.0	.0	.5	14.0	12.5	13.0	25.0	23.0	23.5
29	---	---	---	.5	.0	.0	14.5	14.0	14.0	25.0	23.0	24.0
30	---	---	---	1.0	.0	.5	14.0	13.0	13.5	24.5	22.5	24.0
31	---	---	---	2.0	.5	1.0	---	---	---	25.0	22.5	24.0
MONTH				2.0	.0	.0	14.5	1.0	7.0	25.0	10.0	16.5
DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
JUNE			JULY			AUGUST			SEPTEMBER			
1	24.5	22.5	23.5	---	---	---	25.5	22.5	23.0	23.5	22.5	23.0
2	24.0	22.0	22.5	---	---	---	23.5	23.0	23.5	23.0	22.5	22.5
3	22.5	21.0	22.0	---	---	---	24.0	23.0	23.5	23.0	22.5	23.0
4	21.0	19.0	20.5	---	---	---	23.5	23.0	23.0	23.0	22.5	22.5
5	21.5	19.0	20.0	---	---	---	23.5	22.5	23.0	24.0	22.0	22.5
6	22.5	19.5	20.5	---	---	---	24.5	23.0	23.5	23.0	22.5	22.5
7	---	---	---	---	---	---	24.5	23.5	23.5	23.5	22.5	23.0
8	---	---	---	---	---	---	24.0	23.5	24.0	24.0	23.0	23.5
9	---	---	---	---	---	---	24.5	24.0	24.0	24.5	23.0	23.5
10	---	---	---	---	---	---	25.0	23.5	24.5	24.5	24.0	24.0
11	---	---	---	---	---	---	25.5	24.5	25.0	25.0	24.0	24.5
12	---	---	---	---	---	---	25.5	24.0	25.0	24.5	22.0	23.5
13	---	---	---	---	---	---	26.0	24.5	25.0	22.0	18.5	20.5
14	---	---	---	---	---	---	27.0	25.5	26.0	18.5	17.5	18.0
15	---	---	---	---	---	---	26.5	26.0	26.0	19.5	18.5	19.0
16	---	---	---	---	---	---	26.5	25.5	26.0	21.0	19.5	20.0
17	---	---	---	---	---	---	26.5	25.5	26.0	21.0	20.5	20.5
18	---	---	---	24.0	24.0	24.0	26.0	25.0	25.5	20.0	19.0	19.5
19	---	---	---	24.5	23.5	24.0	25.5	25.0	25.5	20.0	19.0	19.5
20	---	---	---	25.5	24.5	25.0	25.0	24.5	25.0	21.0	20.0	20.5
21	---	---	---	26.0	25.0	25.5	26.0	24.5	25.0	21.5	21.0	21.0
22	---	---	---	26.5	25.5	26.0	25.0	23.5	24.5	21.0	19.0	19.5
23	---	---	---	26.5	26.0	26.5	25.0	24.0	24.5	20.0	18.5	19.0
24	---	---	---	26.5	26.0	26.0	25.5	24.5	25.0	19.0	18.5	19.0
25	---	---	---	26.0	25.0	25.5	26.0	24.5	25.0	19.0	18.0	18.5
26	---	---	---	26.0	25.0	25.5	25.0	24.5	25.0	18.5	17.0	17.5
27	---	---	---	25.5	25.0	25.0	25.0	24.0	24.5	17.5	16.5	17.0
28	---	---	---	25.0	24.0	24.5	24.0	23.0	23.5	16.5	16.0	16.5
29	---	---	---	24.5	24.0	24.0	24.0	23.0	23.5	16.0	15.5	16.0
30	---	---	---	23.5	22.5	23.5	23.5	23.0	23.5	15.5	15.0	15.5
31	---	---	---	23.5	22.5	23.0	23.0	22.5	23.0	---	---	---
MONTH							27.0	22.5	24.5	25.0	15.0	20.5

## STREAMS TRIBUTARY TO LAKE HURON

315

04158500 PIGEON RIVER NEAR OWENDALE, MI

LOCATION.--Lat 43°45'49", long 83°14'46", in SW $\frac{1}{4}$  SE $\frac{1}{4}$  sec.36, T.16 N., R.10 E., Huron County, Hydrologic Unit 04080103, on left bank 600 ft (183 m) downstream from bridge on Kilmanagh Road, 2.5 mi (4.0 km) downstream from confluence of East and West Branches, and 2.5 mi (4.0 km) northeast of Owendale.

DRAINAGE AREA.--53.2 mi<sup>2</sup> (138 km<sup>2</sup>), revised.

PERIOD OF RECORD.--October 1952 to current year.

GAGE.--Water-stage recorder. Altitude of gage is 645 ft (197 m) from topographic map. Prior to June 10, 1954, nonrecording gage at site 600 ft (183 m) upstream at same datum.

REMARKS.--Records fair. Several observations of water temperature were made during the year.

AVERAGE DISCHARGE.--26 years, 31.8 ft<sup>3</sup>/s (0.901 m<sup>3</sup>/s), 8.12 in/yr (206 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 2,550 ft<sup>3</sup>/s (72.2 m<sup>3</sup>/s) Mar. 25, 1954, gage height, 10.75 ft (3.277 m), from rating curve extended above 1,200 ft<sup>3</sup>/s (34.0 m<sup>3</sup>/s), site and datum then in use; minimum, 0.1 ft<sup>3</sup>/s (0.003 m<sup>3</sup>/s) July 31, Aug. 1, 1964.

EXTREMES FOR CURRENT YEAR.--Peak discharges above base of 500 ft<sup>3</sup>/s (14.2 m<sup>3</sup>/s) and maximum (\*):

Date	Time	Discharge (ft <sup>3</sup> /s) (m <sup>3</sup> /s)	Gage height (ft) (m)	Date	Time	Discharge (ft <sup>3</sup> /s) (m <sup>3</sup> /s)	Gage height (ft) (m)
Oct. 2	1600	504 14.3	7.12 2.170	Mar. 29	--	621 17.6	ice jam
Dec. 2	1200	586 16.6	7.66 2.335	Apr. 1	2400	587 16.6	7.67 2.338
Mar. 24	unknown	*940 26.6	*a10.2 3.109				

a Ice jam.

Minimum discharge, 0.8 ft<sup>3</sup>/s (0.023 m<sup>3</sup>/s) Sept. 6, 8, gage height, 2.68 ft (0.817 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	109	20	142	24	9.4	6.3	484	16	33	4.9	4.1	1.6
2	441	21	493	21	9.2	6.3	250	15	25	5.3	3.8	1.6
3	242	20	140	19	9.0	6.3	140	14	20	4.8	3.7	1.5
4	83	20	77	18	8.9	6.3	200	13	16	4.3	3.3	1.5
5	62	18	57	17	8.8	6.3	240	14	15	4.3	2.9	1.5
6	50	19	43	16	8.6	6.4	128	15	13	3.7	2.7	1.1
7	41	29	35	15	8.5	6.4	147	14	11	3.4	2.7	1.1
8	48	35	25	14	8.4	6.5	108	13	13	3.1	2.7	1.0
9	108	37	28	14	8.2	6.5	78	19	16	3.4	3.3	1.4
10	92	54	26	13	8.0	6.6	71	19	13	3.2	3.7	1.2
11	63	67	27	13	7.8	7.0	85	16	9.8	3.0	3.1	1.3
12	63	53	28	12	7.6	7.6	81	18	9.5	2.7	2.7	3.4
13	59	41	30	12	7.5	8.6	66	32	11	2.8	2.6	3.7
14	48	35	35	12	7.3	10	53	60	9.2	3.2	2.4	19
15	42	34	51	11	7.1	12	45	53	8.4	3.1	2.2	34
16	66	36	70	11	6.9	15	40	41	8.2	5.6	2.6	30
17	95	51	94	11	6.8	19	36	34	9.3	5.1	2.9	25
18	72	49	112	10	6.7	23	34	31	12	5.5	2.5	34
19	57	38	154	10	6.6	30	35	29	11	5.2	3.1	43
20	49	42	135	10	6.5	40	38	26	9.2	51	3.8	31
21	42	123	131	10	6.4	60	35	50	7.9	41	3.0	32
22	38	96	88	10	6.3	140	31	49	7.0	25	2.4	54
23	34	60	66	10	6.3	380	26	37	5.7	15	2.2	34
24	30	60	56	10	6.2	900	28	29	5.1	10	2.1	22
25	28	64	45	10	6.2	600	26	24	4.5	6.8	2.1	15
26	27	55	40	10	6.2	360	25	20	4.8	5.2	2.2	12
27	26	41	36	10	6.2	250	22	18	4.6	20	2.3	11
28	24	43	33	10	6.2	230	20	14	4.3	20	2.2	19
29	22	39	31	10	---	500	19	12	4.2	10	2.2	18
30	21	38	28	9.8	---	350	17	16	5.8	6.3	1.9	16
31	20	---	25	9.6	---	340	---	45	---	4.6	1.7	---
TOTAL	2202	1338	2421	392.4	207.8	4366.1	2608	806	326.5	291.5	85.1	470.9
MEAN	71.0	44.6	78.1	12.7	7.42	141	86.9	26.0	10.9	9.40	2.75	15.7
MAX	441	123	493	24	9.4	900	484	60	33	51	4.1	54
MIN	20	18	25	9.6	6.2	6.3	17	12	4.2	2.7	1.7	1.0
CFSM	1.34	.84	1.47	.24	.14	2.65	1.63	.49	.21	.18	.05	.30
IN.	1.54	.94	1.69	.27	.15	3.05	1.82	.56	.23	.20	.06	.33

CAL YR 1977	TOTAL	12393.24	MEAN	34.0	MAX	493	MIN	.40	CFSM	.64	IN	8.67
WTR YR 1978	TOTAL	15515.30	MEAN	42.5	MAX	900	MIN	1.0	CFSM	.80	IN	10.85



## STREAMS TRIBUTARY TO LAKE HURON

04159010 PIGEON RIVER NEAR CASEVILLE, MI  
(National stream-quality accounting network station)

LOCATION.--Lat 43°56'22", long 83°14'30" in NW¼ SW¼ sec.31, T.18 N., R.11 E., Huron County, Hydrologic Unit 04080103, at bridge on Kinde Road, 1.5 mi (2.4 km) east of Caseville, and 3.1 mi (5.0 km) upstream from mouth.

DRAINAGE AREA.--125 mi<sup>2</sup> (324 km<sup>2</sup>).

PERIOD OF RECORD.--January to September 1978.

PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE: April to September 1978.

WATER TEMPERATURES: April to September 1978.

REMARKS.--Daily specific conductance and water temperature records are based on once-daily measurements, by a local observer, between 1700 and 1900 hours. Water-discharge measurements are made at times of monthly sampling.

EXTREMES FOR PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE: Maximum daily recorded, 970 micromhos Sept. 28, 1978; minimum daily recorded, 601 micromhos July 24, 1978.

WATER TEMPERATURES: Maximum daily recorded, 27.5°C July 7, 1978; minimum daily recorded, 5.0°C Apr. 9, 1978.

## WATER QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DATE	TIME	STREAM- FLOW, INSTAN- TANEOUS (CFS)	SPF- CIFIC CON- DUCT- ANCE (MICRO- MHOS)	PH (UNITS)	TEMPER- ATURE (DEG C)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED CENT SATUR- ATION	COLI- FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML)	STREP- TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML)	HARD- NESS (MG/L AS CAC03)	HARD- NESS, NONCAR- BONATE (MG/L CAC03)
JAN											
10...	1330	16	940	7.8	.0	11.2	79	100	880	500	180
FEB											
10...	1200	14	877	8.0	.0	7.2	51	120	130	480	180
MAR											
06...	1500	9.1	980	7.8	.0	10.5	72	270	450	430	120
APR											
06...	1245	506	571	7.9	3.5	11.0	86	K2	>1000	300	110
MAY											
03...	1215	22	799	8.5	10.0	14.2	131	59	K5	400	130
JUN											
08...	1130	26	881	7.9	18.0	7.3	77	580	620	500	200
JUL											
17...	1630	1.4	800	8.4	24.0	12.0	144	310	390	390	170
AUG											
17...	0845	1.1	741	8.0	19.5	6.5	71	K160	690	320	140
SEP											
13...	1500	.19	672	8.0	16.5	8.4	87	215	410	300	160

K--BASED ON COLONY COUNT OUTSIDE THE ACCEPTABLE RANGE (NON-IDEAL COLONY COUNT)

DATE	CALCIUM DIS- SOLVED (MG/L AS CA)	MAGNE- SIUM, DIS- SOLVED (MG/L AS MG)	SODIUM, DIS- SOLVED (MG/L AS NA)	SODIUM AD- SORP- TION RATIO	SODIUM PERCENT	POTAS- SIUM, DIS- SOLVED (MG/L AS K)	BICAR- BONATE (MG/L AS HC03)	CAR- BONATE (MG/L AS CO3)	ALKA- LINITY (MG/L AS CAC03)	CARBON DIOXIDE DIS- SOLVED (MG/L AS CO2)	SULFATE DIS- SOLVED (MG/L AS SO4)
JAN											
10...	140	36	17	.3	7	2.5	390	0	320	9.9	140
FEB											
10...	140	32	17	.3	7	2.6	370	0	300	5.9	120
MAR											
06...	120	32	22	.5	10	2.8	380	0	312	9.6	120
APR											
06...	84	21	6.6	.2	5	3.7	230	0	189	4.6	64
MAY											
03...	110	31	16	.3	8	2.7	310	8	268	1.7	120
JUN											
08...	140	36	15	.3	6	3.0	360	0	300	7.3	120
JUL											
17...	100	33	20	.4	10	2.8	270	2	225	1.7	150
AUG											
17...	87	26	20	.5	12	3.8	230	0	189	3.7	130
SEP											
13...	78	26	22	.6	13	4.6	170	0	139	2.7	140

## STREAMS TRIBUTARY TO LAKE HURON

317

04159010 PIGEON RIVER NEAR CASEVILLE, MI--CONTINUED

WATER-QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978--CONTINUED

DATE	CHLORIDE, DIS- SOLVED (MG/L AS CL)	FLUORIDE, DIS- SOLVED (MG/L AS F)	SILICA, DIS- SOLVED (MG/L AS SiO2)	SOLIDS, RESIDUE AT 180 DEG. C DIS- SOLVED (MG/L)	SOLIDS, SUM OF CONSTITUENTS, DIS- SOLVED (MG/L)	SOLIDS, DIS- SOLVED (TONS PER DAY)	NITRO- GEN, NO2+NO3 TOTAL (MG/L AS N)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N)	NITRO- GEN, ORGANIC TOTAL (MG/L AS N)	NITRO- GEN,AM- MONIA + ORGANIC TOTAL (MG/L AS N)
JAN 10...	40	.2	6.9	634	575	27.6	2.9	.14	--	--
FEB 10...	36	.2	8.4	568	539	21.5	1.8	.15	.55	.70
MAR 06...	42	.2	8.1	552	534	13.6	1.5	.21	.63	.84
APR 06...	30	.2	4.9	380	328	519	6.3	.11	1.2	1.3
MAY 03...	41	.2	.1	524	482	31.1	1.6	.07	.89	.96
JUN 08...	51	.2	4.1	626	547	43.9	6.7	.05	1.3	1.3
JUL 17...	45	.2	.8	574	487	2.17	.16	.08	.72	.80
AUG 17...	43	.2	.9	480	424	1.43	.07	.04	.68	.72
SEP 13...	37	.2	1.7	427	393	.22	.01	.04	.92	.96

DATE	NITRO- GEN, NH4 + ORG. SUSP. TOTAL (MG/L AS N)	NITRO- GEN, AM- MONIA + ORGANIC DIS. (MG/L AS N)	NITRO- GEN, TOTAL (MG/L AS N)	NITRO- GEN, TOTAL (MG/L AS NO3)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, DIS- SOLVED (MG/L AS P)	CARRON, ORGANIC TOTAL (MG/L AS C)	SEDI- MENT, DIS- CHARGE, SUS- PENDED (MG/L)	SEDI- MENT, DIS- CHARGE, SUS- PENDED (T/DAY)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM
JAN 10...	--	.61	--	--	.03	.02	--	3	.13	100
FEB 10...	.08	.62	2.5	11	.05	.03	11	6	.23	100
MAR 06...	.04	.80	2.3	10	.09	.06	1.6	34	.84	100
APR 06...	.20	1.1	7.6	34	.12	.06	--	27	37	100
MAY 03...	.25	.71	2.6	11	.09	.06	9.9	10	.59	100
JUN 08...	.46	.84	8.0	35	.11	.07	8.1	66	4.6	100
JUL 17...	.16	.64	.96	4.3	.17	.15	--	--	--	--
AUG 17...	.00	.91	.79	3.5	.14	.12	7.3	2	.01	100
SEP 13...	.51	.45	.97	4.3	.10	.06	6.4	4	.00	100

STREAMS TRIBUTARY TO LAKE HURON  
04159010 PIGEON RIVER NEAR CASEVILLE, MI--CONTINUED

WATER-QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978--CONTINUED

DATE	TIME	ARSENIC TOTAL (UG/L AS AS)	ARSENIC DIS- SOLVED (UG/L AS AS)	BARIUM, TOTAL RECOV- ERABLE (UG/L AS BA)	BARIUM, DIS- SOLVED (UG/L AS BA)	CADMIUM TOTAL RECOV- ERABLE (UG/L AS CD)	CADMIUM DIS- SOLVED (UG/L AS CD)	CHRO- MIUM, TOTAL RECOV- ERABLE (UG/L AS CR)	CHRO- MIUM, DIS- SOLVED (UG/L AS CR)	COBALT, TOTAL RECOV- ERABLE (UG/L AS CO)
JAN 10...	1330	1	0	200	200	1	0	10	1	0
APR 06...	1245	1	1	0	0	0	0	<10	0	0
JUL 17...	1630	4	4	0	0	--	1	20	0	0

DATE	COBALT, DIS- SOLVED (UG/L AS CO)	COPPER, TOTAL RECOV- ERABLE (UG/L AS CU)	COPPER, DIS- SOLVED (UG/L AS CU)	IRON, TOTAL RECOV- ERABLE (UG/L AS FE)	IRON, DIS- SOLVED (UG/L AS FE)	LEAD, TOTAL RECOV- ERABLE (UG/L AS PR)	LEAD, DIS- SOLVED (UG/L AS PB)	MANGA- NESE, TOTAL RECOV- ERABLE (UG/L AS MN)	MANGA- NESE, DIS- SOLVED (UG/L AS MN)	MERCURY TOTAL RECOV- ERABLE (UG/L AS HG)
JAN 10...	0	3	1	250	20	3	3	50	50	.9
APR 06...	0	14	2	1100	20	9	0	20	0	<.5
JUL 17...	0	--	7	110	40	5	0	50	40	.5

DATE	MERCURY DIS- SOLVED (UG/L AS HG)	SELE- NIUM, TOTAL (UG/L AS SE)	SELE- NIUM, DIS- SOLVED (UG/L AS SE)	SILVER, TOTAL RECOV- ERABLE (UG/L AS AG)	SILVER, DIS- SOLVED (UG/L AS AG)	ZINC, TOTAL RECOV- ERABLE (UG/L AS ZN)	ZINC, DIS- SOLVED (UG/L AS ZN)	CARBON, ORGANIC DIS- SOLVED (MG/L AS C)	CARBON, ORGANIC SUS- PENDED TOTAL (MG/L AS C)
JAN 10...	<.5	1	1	0	0	30	10	7.5	.0
APR 06...	<.5	1	1	0	0	10	0	5.0	1.8
JUL 17...	.5	0	0	0	0	20	0	8.9	.5

QUALITATIVE AND ASSOCIATED QUANTITATIVE ANALYSES OF BIOLOGICAL DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
PERIPHYTON

DATE	TIME	LENGTH OF EXPO- SURE (DAYS)	PERI- PHYTON BIOMASS ASH WEIGHT G/SQ M	PERI- PHYTON BIOMASS TOTAL DRY WEIGHT G/SQ M	CHLOR-A PERI- PHYTON CHROMO- GRAPHIC FLUOROM (MG/M2)	CHLOR-B PERI- PHYTON CHROMO- GRAPHIC FLUOROM (MG/M2)
FEB 10...	1200	31	.315	.866	.000	.000
MAY 03...	1215	--	1.50	2.76	1.34	.260
AUG 17...	0845	31	15.9	20.1	55.2	10.5

04159010 PIGEON RIVER NEAR CASEVILLE, MI--CONTINUED

## WATER-QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978--CONTINUED

SPECIFIC CONDUCTANCE (MICROMHOS/CM AT 25 DEG. C), WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
ONCE-DAILY

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1							---	846	809	820	744	---
2							---	---	876	799	730	---
3							---	---	---	794	722	---
4							---	761	923	---	715	---
5							---	785	930	742	712	---
6							---	747	---	742	705	---
7							653	729	923	703	683	---
8							692	774	898	713	681	---
9							720	768	878	736	---	---
10							750	738	851	749	675	---
11							781	755	839	764	658	---
12							785	755	827	759	672	646
13							785	858	830	---	672	---
14							803	877	798	---	---	616
15							806	786	798	---	---	611
16							813	---	734	---	---	686
17							813	785	808	---	---	730
18							822	784	---	788	---	781
19							806	787	815	783	---	846
20							813	792	902	---	---	880
21							799	792	912	701	---	883
22							784	801	906	---	---	782
23							798	773	887	---	---	746
24							787	791	884	601	---	835
25							867	808	902	660	---	894
26							875	797	868	710	---	940
27							847	826	885	717	---	---
28							869	834	---	746	---	970
29							846	---	755	---	---	969
30							891	622	823	769	---	963
31							---	745	---	758	---	---

TEMPERATURE (DEG. C) OF WATER, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
ONCE-DAILY

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1							---	13.0	21.0	20.0	23.5	---
2							---	---	22.0	20.0	22.0	---
3							---	---	---	22.5	22.0	---
4							---	13.5	18.5	---	21.5	---
5							---	10.5	20.0	24.0	22.5	---
6							---	15.0	---	25.5	23.0	---
7							7.0	17.0	21.0	27.5	24.0	---
8							6.5	14.5	18.5	22.0	26.0	---
9							5.0	15.0	19.0	24.0	---	---
10							6.5	17.0	21.0	23.0	21.5	---
11							7.0	17.0	22.0	22.0	22.5	---
12							9.0	16.5	20.0	24.5	25.0	17.0
13							7.5	16.0	19.0	---	---	---
14							8.0	16.0	18.0	---	---	18.0
15							9.0	15.0	19.0	---	---	19.0
16							10.0	---	18.0	---	---	19.0
17							11.0	18.0	21.0	---	---	17.0
18							9.0	21.5	---	23.0	---	17.0
19							9.5	23.0	21.0	27.0	---	17.0
20							7.5	21.0	23.0	---	---	20.5
21							9.0	19.5	21.0	25.0	---	18.0
22							11.5	20.0	22.0	---	---	17.0
23							11.0	19.5	21.0	---	---	16.5
24							13.0	21.0	22.0	24.5	---	17.0
25							14.0	23.0	23.0	25.0	---	16.0
26							14.5	25.0	24.0	24.0	---	16.0
27							13.5	26.0	26.0	25.0	---	---
28							17.0	25.5	---	22.0	---	14.5
29							16.0	---	24.5	---	---	14.5
30							14.0	23.0	23.5	20.0	---	14.5
31							---	21.0	---	22.0	---	---

## STREAMS TRIBUTARY TO ST. CLAIR RIVER

04159130 ST. CLAIR RIVER AT PORT HURON, MI  
(National stream-quality accounting network station)

LOCATION.--Lat 42°59'19", long 82°25'29", in SE¼ sec.3, T.6 N., R.17 E., St. Clair County, Hydrologic Unit 04090001, at Port Huron municipal water treatment plant at Pine Grove Park at Port Huron.

DRAINAGE AREA.--222,400 mi<sup>2</sup> (576,000 km<sup>2</sup>), approximately.

PERIOD OF RECORD.--Water years 1970-73, January to September 1978.

## PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE: April to September 1978.

WATER TEMPERATURES: April to September 1978.

REMARKS.--Daily specific conductance and water-temperature records are once-daily measurements made by a local observer. Samples are collected from a stilling well located in the Port Huron municipal water treatment plant. In May and July depth-integrated samples were collected by boat along river cross section in the vicinity of the water treatment plant.

COOPERATION.--Water discharges were furnished by the National Oceanic and Atmospheric Administration.

## EXTREMES FOR PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE: Maximum daily, 220 micromhos Sept. 12, 1978, minimum daily, 200 micromhos Apr. 19, 1978.

WATER TEMPERATURES: Maximum daily, 21.0°C Aug. 14-16, 19, 27-29, Sept. 9; minimum daily, 2.5°C Apr. 18, 19, 1978.

EXTREMES OUTSIDE PERIOD OF DAILY RECORD.--Specific conductance values of 224 micromhos Feb. 24, 1970, Mar. 6, 1972, and 164 micromhos July 3, 1972 were observed. A water temperature of 23.0°C was observed on Aug. 3, 17, 1970. Water temperatures of 0.5°C were observed on many days during winter periods.

## WATER QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DATE	TIME	STREAM- FLOW, INSTAN- TANEOUS (CFS)	SPE- CIFIC CON- DUCT- ANCE (MICRO- MHOS)	PH (UNITS)	TEMPER- ATURE (DEG C)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION)	COLI- FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML)	STREP- TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML)	HARD- NESS (MG/L AS CAC03)	HARD- NESS, NONCAR- BONATE (MG/L CAC03)
JAN 09...	1515	195000	205	7.6	.5	13.8	99	<1	380	97	15
FEB 14...	1515	167000	204	8.1	.5	13.0	92	<1	<1	100	26
MAR 14...	1500	173000	198	8.0	1.0	13.8	100	K3	34	100	18
APR 17...	1630	178000	206	7.9	5.0	10.6	84	<1	K1	98	16
MAY 17...	1245	186000	198	8.1	8.0	12.2	104	K1	K1	100	20
JUN 12...	1500	188000	194	8.3	13.0	9.8	94	K1	K16	96	23
JUL 13...	1145	192000	205	8.4	18.0	9.6	101	K2	K2	98	0
AUG 21...	1545	194000	198	8.3	21.0	7.9	89	<1	47	97	29
SEP 18...	1600	202000	200	8.3	17.0	8.0	84	K1	K4	100	21

K--BASED ON COLONY COUNT OUTSIDE THE ACCEPTABLE RANGE (NON-IDEAL COLONY COUNT)

DATE	CALCIUM DIS- SOLVED (MG/L AS CA)	MAGNE- SIUM, DIS- SOLVED (MG/L AS MG)	SODIUM, DIS- SOLVED (MG/L AS NA)	SODIUM AD- SORP- TION RATIO	SODIUM PERCENT	POTAS- SIUM, DIS- SOLVED (MG/L AS K)	BICAR- BONATE (MG/L AS HC03)	CAR- BONATE (MG/L AS C03)	ALKA- LINITY (MG/L AS CAC03)	CARBON DIOXIDE DIS- SOLVED (MG/L AS C02)	SULFATE DIS- SOLVED (MG/L AS S04)
JAN 09...	27	7.2	3.5	.2	7	1.0	100	0	82	4.0	16
FEB 14...	29	7.4	3.7	.2	7	1.0	94	0	77	1.2	17
MAR 14...	30	7.1	3.5	.2	7	1.0	100	0	82	1.6	17
APR 17...	28	6.9	3.4	.2	7	1.0	100	0	82	2.0	17
MAY 17...	29	7.2	3.4	.1	7	1.0	100	0	82	1.3	17
JUN 12...	27	7.0	3.3	.1	7	1.0	100	0	73	.8	15
JUL 13...	27	7.5	3.4	.2	7	1.1	100	10	99	.8	16
AUG 21...	27	7.1	3.5	.2	7	1.0	82	0	67	.7	16
SEP 18...	27	8.6	3.4	.1	7	.8	100	0	82	.8	16



STREAMS TRIBUTARY TO LAKE ST. CLAIR

321

04159130 ST. CLAIR RIVER AT PORT HURON, MI--CONTINUED

WATER-QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978--CONTINUED

DATE	CHLORIDE, DIS- SOLVED (MG/L AS CL)	FLUORIDE, DIS- SOLVED (MG/L AS F)	SILICA, DIS- SOLVED (MG/L AS SiO2)	SOLIDS, RESIDUE AT 180 DEG. C DIS- SOLVED (MG/L)	SOLIDS, SUM OF CONSTITUENTS, DIS- SOLVED (MG/L)	SOLIDS, DIS- SOLVED (TONS PER DAY)	NITRO- GEN, NO2+NO3 TOTAL (MG/L AS N)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N)	NITRO- GEN, ORGANIC TOTAL (MG/L AS N)	NITRO- GEN+AM- MONIA + ORGANIC TOTAL (MG/L AS N)
JAN 09...	5.9	.1	1.0	114	111	60000	.31	.02	--	--
FEB 14...	5.6	.1	1.2	126	111	56800	.28	.01	.22	.23
MAR 14...	6.4	.1	1.9	124	116	57900	.41	.01	.61	.62
APR 17...	6.5	.1	.7	123	113	59100	.30	.00	.44	.44
MAY 17...	6.7	.1	1.1	119	115	59800	.28	.00	.25	.25
JUN 12...	6.2	.1	1.0	117	154	59400	.28	.01	.18	.19
JUL 13...	5.7	.1	.6	136	121	70500	.26	.01	.50	.51
AUG 21...	7.2	.1	.8	126	103	66000	.26	.00	.11	.11
SEP 18...	5.8	.1	1.1	112	112	61100	.23	.04	.00	.00

DATE	NITRO- GEN+NH4 + ORG. SUSP. TOTAL (MG/L AS N)	NITRO- GEN+AM- MONIA + ORGANIC DIS. (MG/L AS N)	NITRO- GEN, TOTAL (MG/L AS N)	NITRO- GEN, TOTAL (MG/L AS NO3)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, DIS- SOLVED (MG/L AS P)	CARBON, ORGANIC TOTAL (MG/L AS C)	SEDI- MENT, SUS- PENDED (MG/L)	SEDI- MENT DIS- CHARGE, SUS- PENDED (T/DAY)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM
JAN 09...	--	.00	--	--	.00	.00	--	--	--	--
FEB 14...	.15	.08	.51	2.3	.00	.00	12	--	--	--
MAR 14...	.50	.12	1.0	4.6	.00	.00	1.6	--	--	--
APR 17...	.19	.25	.74	3.3	.01	.00	8.8	--	--	--
MAY 17...	.12	.13	.53	2.3	.01	.00	--	0	.00	100
JUN 12...	.03	.16	.47	2.1	.00	.00	4.0	--	--	--
JUL 13...	.23	.28	.77	3.4	.00	.00	--	3	1560	100
AUG 21...	.00	.13	.37	1.6	.00	.00	4.2	--	--	--
SEP 18...	.00	.00	.23	1.0	.00	.00	1.1	--	--	--

STREAMS TRIBUTARY TO LAKE ST. CLAIR  
04159130 ST. CLAIR RIVER AT PORT HURON, MI--CONTINUED

WATER-QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978--CONTINUED

DATE	TIME	ARSENIC TOTAL (UG/L AS AS)	ARSENIC DIS- SOLVED (UG/L AS AS)	BARIUM, TOTAL RECOV- ERABLE (UG/L AS BA)	BARIUM, DIS- SOLVED (UG/L AS BA)	CADMIUM TOTAL RECOV- ERABLE (UG/L AS CD)	CADMIUM DIS- SOLVED (UG/L AS CD)	CHRO- MIUM, TOTAL RECOV- ERABLE (UG/L AS CR)	CHRO- MIUM, DIS- SOLVED (UG/L AS CR)	COBALT, TOTAL RECOV- ERABLE (UG/L AS CO)
JAN 09...	1515	0	0	0	0	1	0	<10	0	0
MAY 17...	1245	1	1	0	0	0	1	<10	0	0
JUL 13...	1145	1	1	100	0	0	1	10	0	0

DATE	CORALIT, DIS- SOLVED (UG/L AS CO)	COPPER, TOTAL RECOV- ERABLE (UG/L AS CU)	COPPER, DIS- SOLVED (UG/L AS CU)	IRON, TOTAL RECOV- ERABLE (UG/L AS FE)	IRON, DIS- SOLVED (UG/L AS FE)	LEAD, TOTAL RECOV- ERABLE (UG/L AS PB)	LEAD, DIS- SOLVED (UG/L AS PB)	MANGA- NESE, TOTAL RECOV- ERABLE (UG/L AS MN)	MANGA- NESE, DIS- SOLVED (UG/L AS MN)	MERCURY TOTAL RECOV- ERABLE (UG/L AS HG)
JAN 09...	0	8	2	150	0	3	2	10	10	<.5
MAY 17...	0	2	0	60	10	6	--	0	0	<.5
JUL 13...	0	4	2	40	10	23	2	10	0	.5

DATE	MERCURY DIS- SOLVED (UG/L AS HG)	SELE- NIUM, TOTAL (UG/L AS SE)	SELE- NIUM, DIS- SOLVED (UG/L AS SE)	SILVER, TOTAL RECOV- ERABLE (UG/L AS AG)	SILVER, DIS- SOLVED (UG/L AS AG)	ZINC, TOTAL RECOV- ERABLE (UG/L AS ZN)	ZINC, DIS- SOLVED (UG/L AS ZN)	CARRON, ORGANIC DIS- SOLVED (MG/L AS C)	CARBON, ORGANIC SUS- PENDED TOTAL (MG/L AS C)
JAN 09...	<.5	0	0	0	0	20	20	11	.3
MAY 17...	<.5	0	0	0	0	10	0	3.4	--
JUL 13...	.5	0	0	0	0	50	10	1.4	.3

QUALITATIVE AND ASSOCIATED QUANTITATIVE ANALYSES OF BIOLOGICAL DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
PERIPHYTON

DATE	TIME	LENGTH OF EXPO- SURE (DAYS)	PERI- PHYTON BIOMASS ASH WEIGHT G/SQ M	PERI- PHYTON BIOMASS DRY WEIGHT G/SQ M	CHLOR-A PERI- PHYTON CHROMO- GRAPHIC FLUOROM (MG/M2)	CHLOR-B PERI- PHYTON CHROMO- GRAPHIC FLUOROM (MG/M2)
MAR 14...	1500	29	.000	.000	.000	.000
JUN 12...	1500	26	.551	.709	.810	.220
SEP 18...	1600	28	--	--	--	--

STREAMS TRIBUTARY TO LAKE ST. CLAIR  
04159130 ST. CLAIR RIVER AT PORT HURON, MI--CONTINUED

323

WATER-QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978--CONTINUED

SPECIFIC CONDUCTANCE (MICROMHOS/CM AT 25 DEG. C), WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978 ONCE-DAILY												
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1							---	205	213	204	208	208
2							---	212	208	204	206	205
3							---	---	209	202	---	205
4							---	210	210	202	205	---
5							---	211	210	202	207	205
6							---	219	208	202	206	205
7							---	216	206	202	206	---
8							---	209	208	202	206	207
9							---	202	205	205	207	207
10							---	211	205	---	209	207
11							---	208	205	---	209	208
12							---	203	---	---	207	220
13							---	205	205	207	207	207
14							---	203	204	207	212	207
15							---	207	204	206	206	---
16							---	208	204	207	207	---
17							---	208	204	209	207	---
18							204	208	204	206	207	207
19							200	208	204	207	207	205
20							206	207	204	205	209	203
21							211	213	204	205	208	---
22							205	211	204	---	205	204
23							---	211	204	---	205	203
24							204	213	204	206	206	203
25							206	215	204	205	206	203
26							208	217	204	205	205	203
27							209	216	204	---	206	203
28							206	214	204	209	208	203
29							203	---	204	208	209	203
30							210	214	204	---	206	203
31							---	210	---	208	---	---

TEMPERATURE (DEG. C) OF WATER, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978 ONCE-DAILY												
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1							---	5.5	11.0	17.5	19.5	20.0
2							---	5.5	10.0	16.0	19.5	20.0
3							---	---	12.0	14.5	19.5	20.0
4							---	5.0	12.5	13.5	19.5	---
5							---	5.5	12.0	14.5	19.5	20.0
6							---	6.0	12.0	15.0	19.5	20.0
7							---	6.0	12.0	15.0	19.5	---
8							---	6.0	12.0	15.0	19.5	20.0
9							---	6.0	12.0	15.0	20.0	21.0
10							---	6.5	12.5	---	20.0	20.0
11							---	6.0	13.0	---	20.0	20.0
12							---	6.0	---	---	20.0	20.0
13							---	7.0	11.0	16.5	20.5	19.0
14							---	6.0	12.0	16.5	21.0	19.0
15							---	6.0	12.0	16.5	21.0	---
16							---	7.0	12.5	17.0	21.0	---
17							---	7.0	12.0	18.0	20.5	---
18							2.5	8.0	12.5	18.0	20.5	17.0
19							2.5	8.5	12.5	18.0	21.0	16.5
20							3.5	9.5	13.5	18.5	20.5	16.0
21							4.0	9.0	14.0	19.5	20.5	---
22							4.0	7.5	14.0	---	20.5	16.0
23							---	9.5	14.0	---	20.5	16.0
24							4.0	11.0	14.5	19.0	20.5	16.0
25							4.5	11.0	15.0	19.0	20.5	16.0
26							5.0	12.0	15.0	19.5	20.5	15.5
27							5.0	13.0	16.0	---	21.0	15.5
28							5.5	12.0	16.5	19.5	21.0	15.5
29							5.5	---	16.0	19.5	21.0	15.0
30							6.0	10.5	16.5	19.5	20.5	14.5
31							---	11.0	---	19.0	---	---

## STREAMS TRIBUTARY TO ST. CLAIR RIVER

04159488 SILVER CREEK NEAR JEDDO, MI

LOCATION.--Lat 43°08'40", long 82°39'07", in SE¼ NW¼ sec.12, T.8 N., R.15 E., St. Clair County, Hydrologic Unit 04090001, on left bank 10 ft (3 m) downstream of bridge on Comstock Road, 3.5 mi (5.6 km) west of Jeddo.

DRAINAGE AREA.--20.6 mi<sup>2</sup> (53.4 km<sup>2</sup>).

PERIOD OF RECORD.--May to September 1978.

GAGE.--Water-stage recorder. Datum of gage is 707.43 ft (215.625 m) National Geodetic Vertical Datum of 1929 (levels by local surveying firm).

REMARKS.--Records good. Several observations of water temperature were made during the year.

EXTREMES FOR CURRENT YEAR.--Maximum discharge during period May to September, 194 ft<sup>3</sup>/s (5.49 m<sup>3</sup>/s) May 13, gage height, 6.22 ft (1.896 m); minimum, 0.14 ft<sup>3</sup>/s (0.004 m<sup>3</sup>/s) June 19, 20, 21, 25, 26, Aug. 17, 18; minimum gage height, 3.62 ft (1.103 m) Aug. 17, 18.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT
1								---	1.1	.45	.64	.25
2								---	1.2	.51	.49	.21
3								---	1.1	.45	.51	.44
4								---	.93	.45	.50	.37
5								---	.81	.43	.43	.30
6								---	.72	.31	.38	.25
7								---	.68	.27	.38	.22
8								---	.80	.42	.34	.23
9								---	.40	.51	.30	.27
10								---	.32	.43	.30	.31
11								9.7	.29	.45	.27	.86
12								49	1.1	.42	.25	3.0
13								121	1.9	.56	.21	.80
14								97	.75	.63	.23	4.8
15								44	.65	.49	.26	4.7
16								17	.49	.45	.24	1.3
17								9.2	.42	.42	.17	.69
18								6.9	.33	.38	.19	3.5
19								5.3	.19	.49	.62	1.7
20								31	.14	.65	.28	.93
21								76	.61	1.0	.22	.73
22								14	.25	.49	.27	.55
23								6.2	.42	.37	.24	.38
24								4.4	.40	.43	.25	.28
25								3.4	.21	.45	.21	.22
26								2.6	.17	.60	.20	.22
27								2.2	.26	.89	.18	.28
28								1.8	.33	.48	.32	.31
29								1.5	.28	.47	.25	.33
30								1.3	.27	.60	.27	.43
31								1.3	---	.60	.27	---
TOTAL								---	17.52	15.55	9.67	28.86
MEAN								---	.58	.50	.31	.96
MAX								---	1.9	1.0	.64	4.8
MIN								---	.14	.27	.17	.21
CFSM								---	.03	.02	.02	.05
IN.								---	.03	.03	.02	.05

## STREAMS TRIBUTARY TO ST. CLAIR RIVER

325

04159500 BLACK RIVER NEAR FARGO, MI

LOCATION.--Lat 43°05'32", long 82°37'05", in NW¼ sec.32, T.8 N., R.16 E., St. Clair County, Hydrologic Unit 04090001, on left bank 20 ft (6 m) downstream from bridge on Norman Road, 2.1 mi (3.4 km) east of Fargo, 5.3 mi (8.5 km) upstream from Mill Creek, and 12 mi (19 km) northwest of Port Huron.

DRAINAGE AREA.--480 mi<sup>2</sup> (1,243 km<sup>2</sup>).

PERIOD OF RECORD.--February 1944 to current year.

REVISED RECORDS.--WSP 1307: 1950(M). WSP 1627: 1956-58. WSP 2112: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 613.75 ft (187.071 m) National Geodetic Vertical Datum of 1929 (levels by Michigan Department of Natural Resources). Prior to July 9, 1954, nonrecording gage at same site and datum.

REMARKS.--Records good except those for the winter period, which are poor. Several observations of water temperature were made during the year.

AVERAGE DISCHARGE.--34 years, 278 ft<sup>3</sup>/s (7.873 m<sup>3</sup>/s), 7.87 in/yr (200 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 14,400 ft<sup>3</sup>/s (408 m<sup>3</sup>/s) Apr. 5, 1947, gage height, 16.06 ft (4.895 m), from flood-mark, from rating curve extended above 9,500 ft<sup>3</sup>/s (269 m<sup>3</sup>/s); maximum gage height observed, 18.05 ft (5.502 m) Feb. 20, 1951, backwater from ice; minimum discharge observed, 1.8 ft<sup>3</sup>/s (0.051 m<sup>3</sup>/s) Sept. 18, 19, 1946.

EXTREMES FOR CURRENT YEAR.--Peak discharges above base of 3,500 ft<sup>3</sup>/s (99.1 m<sup>3</sup>/s) and maximum (\*):

Date	Time	Discharge (ft <sup>3</sup> /s) (m <sup>3</sup> /s)	Gage height (ft) (m)	Date	Time	Discharge (ft <sup>3</sup> /s) (m <sup>3</sup> /s)	Gage height (ft) (m)
Mar. 24	--	*7000 198	*a14.07 4.289	Apr. 2	0300	3940 112	10.20 3.109

a Ice jam.

Minimum discharge, 5.5 ft<sup>3</sup>/s (0.156 m<sup>3</sup>/s) Sept. 2, gage height, 1.61 ft (0.491 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	290	56	728	73	64	62	3540	121	83	30	23	7.0
2	1240	55	1770	72	64	62	3760	118	77	31	22	6.0
3	1380	51	1540	72	64	62	2850	109	70	29	23	8.5
4	752	54	760	72	63	62	2280	101	68	29	23	9.5
5	398	55	385	71	63	62	3220	103	64	29	22	8.0
6	262	55	270	71	63	62	2730	101	59	29	20	6.5
7	196	56	250	70	63	62	2090	103	56	28	19	6.5
8	178	62	230	70	63	62	1600	104	57	26	21	7.0
9	590	86	220	70	63	62	960	220	54	23	19	7.2
10	656	160	210	70	63	62	664	248	52	21	19	7.0
11	395	285	230	69	63	70	644	184	50	23	18	7.1
12	280	302	300	69	63	84	640	235	51	23	18	13
13	238	220	430	69	63	100	509	482	59	22	18	18
14	200	162	600	68	63	125	395	880	52	23	15	33
15	160	128	800	68	63	150	325	728	52	22	16	55
16	137	146	1200	68	63	175	275	473	49	28	17	62
17	132	275	1600	68	63	210	240	325	46	27	16	59
18	125	282	2000	67	63	260	228	250	44	27	16	71
19	119	232	2200	67	63	350	218	206	43	25	18	84
20	123	228	2100	67	63	500	255	208	42	25	16	136
21	104	479	1600	66	63	1100	298	476	43	29	18	132
22	95	500	1200	66	63	2400	258	419	41	28	19	159
23	86	365	900	66	63	5000	212	310	39	25	18	179
24	82	358	860	66	63	6000	196	220	39	27	19	117
25	75	372	480	66	63	4800	215	176	38	27	18	79
26	68	325	350	65	63	3800	204	146	36	25	17	59
27	68	208	250	65	63	3400	178	130	35	29	16	47
28	65	210	190	65	63	2970	156	116	32	27	15	41
29	64	188	130	65	---	3010	143	108	33	24	15	34
30	59	166	100	65	---	2960	128	95	31	24	11	32
31	55	---	76	64	---	2980	---	87	---	23	7.5	---
TOTAL	8672	6121	23959	2110	1767	41064	29411	7582	1495	808	552.5	1490.3
MEAN	280	204	773	68.1	63.1	1325	980	245	49.8	26.1	17.8	49.7
MAX	1380	500	2200	73	64	6000	3760	880	83	31	23	179
MIN	55	51	76	64	63	62	128	87	31	21	7.5	6.0
CFSM	.58	.43	1.61	.14	.13	2.76	2.04	.51	.10	.05	.04	.10
IN.	.67	.47	1.86	.16	.14	3.18	2.28	.59	.12	.06	.04	.12

CAL YR 1977 TOTAL 76612.5 MEAN 210 MAX 2200 MIN 8.0 CFSM .44 IN 5.94  
WTR YR 1978 TOTAL 125031.8 MEAN 343 MAX 6000 MIN 6.0 CFSM .72 IN 9.69



## STREAMS TRIBUTARY TO ST. CLAIR RIVER

04160570 NORTH BRANCH BELLE RIVER AT IMLAY CITY, MI

LOCATION.--Lat 43°01'49", long 83°04'02", in SW¼ NW¼ sec.16, T.7 N., R.12 E., Lapeer County, Hydrologic Unit 04090001, on left bank 12 ft (4 m) upstream from bridge on State Highway 21, and 0.6 mi (1.0 km) northeast of Imlay City.

DRAINAGE AREA.--18.0 mi<sup>2</sup> (46.6 km<sup>2</sup>).

PERIOD OF RECORD.--August 1965 to current year.

GAGE.--Water-stage recorder and concrete control. Altitude of gage is 800 ft (244 m) from topographic map (nearest 10 ft).

REMARKS.--Records good except those for the winter period, which are fair. Some diversion by pumping for sprinkler irrigation. Several observations of water temperature were made during the year.

AVERAGE DISCHARGE.--13 years, 11.5 ft<sup>3</sup>/s (0.326 m<sup>3</sup>/s), 8.68 in/yr (220 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 334 ft<sup>3</sup>/s (9.46 m<sup>3</sup>/s) Apr. 19, 1975, gage height, 9.33 ft (2.844 m); no flow for part of each day June 27 and 28, 1977, caused by irrigation pumpage; minimum gage height, 2.27 ft (0.692 m) June 27, 1977.

EXTREMES FOR CURRENT YEAR.--Peak discharges above base of 60 ft<sup>3</sup>/s (1.70 m<sup>3</sup>/s) and maximum (\*):

Date	Time	Discharge (ft <sup>3</sup> /s) (m <sup>3</sup> /s)	Gage height (ft) (m)	Date	Time	Discharge (ft <sup>3</sup> /s) (m <sup>3</sup> /s)	Gage height (ft) (m)
Dec. 1	2100	66 1.87	4.88 1.487	Apr. 1	1700	129 3.65	6.33 1.929
Mar. 23	2400	*179 5.07	*7.27 2.216	Apr. 4	2300	134 3.79	6.41 1.954
Mar. 28	2300	115 3.26	6.01 1.832				

Minimum discharge, 0.08 ft<sup>3</sup>/s (0.002 m<sup>3</sup>/s) July 19, gage height, 2.98 ft (0.908 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	39	3.6	43	5.0	6.4	4.4	124	6.6	4.3	2.1	1.5	.55
2	50	3.4	51	5.0	6.4	4.4	94	6.3	4.2	3.0	1.5	.51
3	31	3.1	32	4.9	6.4	4.4	74	5.8	3.8	2.7	2.5	.44
4	16	3.8	20	4.9	6.4	4.4	96	5.5	3.5	2.7	1.8	.42
5	8.9	3.1	16	4.9	6.4	4.4	106	6.7	3.5	2.3	1.4	.40
6	15	9.9	12	4.9	6.5	4.4	68	7.2	3.0	2.1	1.2	.42
7	8.6	22	9.0	4.9	6.5	4.4	59	6.9	2.8	1.9	1.1	.45
8	7.3	16	8.6	4.9	6.4	4.4	40	7.5	3.8	1.7	1.3	.46
9	12	12	8.2	4.9	5.9	4.4	30	9.8	4.2	1.6	1.3	.44
10	8.5	31	8.0	5.0	5.5	4.4	26	8.9	3.5	1.4	1.2	.27
11	5.3	28	10	5.0	5.2	4.5	25	8.0	2.8	1.3	1.1	.29
12	6.2	18	14	5.0	5.0	5.0	22	12	4.2	1.2	1.0	.96
13	10	13	18	5.0	4.8	6.0	18	22	6.5	1.2	.90	1.2
14	3.9	9.7	25	5.0	4.7	7.0	15	24	4.5	1.1	.78	1.6
15	5.1	9.3	31	5.0	4.6	8.0	13	21	4.0	1.0	.77	1.8
16	5.4	17	34	5.1	4.5	9.0	11	16	3.8	1.0	1.0	1.6
17	4.8	24	39	5.2	4.5	11	10	12	4.0	.92	.99	2.3
18	6.8	20	43	5.2	4.4	15	9.9	12	4.2	.90	.95	4.5
19	11	15	49	5.3	4.4	20	13	9.8	3.8	.83	1.7	3.6
20	5.8	19	45	5.4	4.4	25	16	12	2.8	.98	1.8	2.7
21	5.1	34	41	5.6	4.4	70	15	21	12	1.4	1.2	2.5
22	4.6	22	28	5.7	4.4	115	12	13	7.3	1.1	1.1	2.4
23	4.0	16	23	5.9	4.4	148	11	10	5.1	.97	1.1	2.1
24	3.8	21	19	6.0	4.4	165	14	8.7	4.0	.94	1.0	1.9
25	3.9	17	14	6.1	4.4	111	12	7.3	4.0	.86	.96	1.7
26	4.0	16	11	6.3	4.4	82	10	6.2	4.1	1.6	.92	1.6
27	4.0	11	9.0	6.3	4.4	78	9.1	5.3	3.0	3.3	.73	1.7
28	3.7	9.2	7.0	6.3	4.4	81	8.2	4.7	2.3	1.8	.76	2.0
29	3.6	8.2	5.6	6.3	---	95	7.6	4.2	1.9	1.5	.79	1.9
30	3.4	8.5	5.0	6.3	---	69	7.1	4.4	1.7	1.4	.74	1.9
31	3.4	---	5.0	6.4	---	90	---	5.1	---	1.4	.63	---
TOTAL	304.1	443.8	683.4	167.7	144.5	1258.5	975.9	309.9	122.6	48.20	35.72	44.61
MEAN	9.81	14.8	22.0	5.41	5.16	40.6	32.5	10.0	4.09	1.55	1.15	1.49
MAX	50	34	51	6.4	6.5	165	124	24	12	3.3	2.5	4.5
MIN	3.4	3.1	5.0	4.9	4.4	4.4	7.1	4.2	1.7	.83	.63	.27
CFSM	.55	.82	1.22	.30	.29	2.26	1.81	.56	.23	.09	.06	.08
IN.	.63	.92	1.41	.35	.30	2.60	2.02	.64	.25	.10	.07	.09

CAL YR 1977 TOTAL 3087.77 MEAN 8.46 MAX 51 MIN .54 CFSM .47 IN 6.38  
WTR YR 1978 TOTAL 4538.93 MEAN 12.4 MAX 165 MIN .27 CFSM .69 IN 9.38

## STREAMS TRIBUTARY TO ST. CLAIR RIVER

327

04160600 BELLE RIVER AT MEMPHIS, MI

LOCATION.--Lat 42°54'03", long 82°46'09", in NW 1/4 sec.35, T.6 N., R.14 E., St. Clair County, Hydrologic Unit 04090001, on right bank, at downstream side of bridge on State Highway 19 at Memphis.

DRAINAGE AREA.--151 mi<sup>2</sup> (391 km<sup>2</sup>).

PERIOD OF RECORD.--October 1962 to current year.

REVISED RECORDS.--WSP 2112: Drainage area.

GAGE.--Water-stage recorder. Altitude of gage is 720 ft (219 m) from topographic map (nearest 5 ft).

REMARKS.--Records good except those for the winter period, which are fair. Several observations of water temperature were made during the year.

AVERAGE DISCHARGE.--16 years, 86.3 ft<sup>3</sup>/s (2.444 m<sup>3</sup>/s), 7.76 in/yr (197 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 4,520 ft<sup>3</sup>/s (128 m<sup>3</sup>/s) Apr. 19, 1975, gage height, 8.96 ft (2.731 m); minimum, 2.3 ft<sup>3</sup>/s (0.065 m<sup>3</sup>/s) Sept. 6, 10, 1978; minimum gage height, 1.17 ft (0.357 m) Sept. 6, 1978.

EXTREMES OUTSIDE PERIOD OF RECORD.--Flood of April 1947, reached a stage of about 9 ft (2.7 m), from information by local residents.

EXTREMES FOR CURRENT YEAR.--Peak discharges above base of 600 ft<sup>3</sup>/s (17.0 m<sup>3</sup>/s) and maximum (\*):

Date	Time	Discharge (ft <sup>3</sup> /s) (m <sup>3</sup> /s)	Gage height (ft) (m)	Date	Time	Discharge (ft <sup>3</sup> /s) (m <sup>3</sup> /s)	Gage height (ft) (m)
Mar. 23	2000	*2260 64.0	*7.81 2.380	Apr. 1	2000	1110 31.4	6.14 1.871

Minimum discharge, 2.3 ft<sup>3</sup>/s (0.065 m<sup>3</sup>/s) Sept. 6, 10; minimum gage height, 1.17 ft (0.357 m) Sept. 6.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	28	22	141	33	40	28	990	44	26	13	7.8	4.3
2	64	21	390	33	40	28	963	41	26	12	7.4	4.0
3	102	22	353	33	40	28	737	36	24	12	7.8	4.0
4	73	21	189	32	40	28	650	35	23	14	7.0	3.7
5	50	21	159	32	40	28	710	34	22	14	8.2	2.8
6	37	24	120	32	40	28	638	36	20	13	8.2	2.4
7	30	26	100	32	40	28	515	37	20	13	7.4	2.4
8	31	59	80	32	39	28	395	38	20	12	6.5	2.8
9	36	62	64	32	36	28	286	61	20	12	6.6	2.6
10	99	67	50	32	34	28	225	87	21	11	5.8	2.4
11	67	175	62	32	32	29	251	62	20	10	6.6	2.8
12	46	131	84	32	31	30	221	63	20	9.8	5.5	3.7
13	39	81	115	32	30	33	179	192	41	9.0	4.9	5.6
14	36	60	147	32	29	39	147	317	67	8.6	5.2	8.4
15	32	51	177	32	28	74	124	264	43	8.2	5.5	12
16	28	47	255	32	28	101	109	191	29	8.6	5.5	9.8
17	27	78	351	33	28	140	98	130	23	13	6.2	10
18	27	106	438	33	28	187	90	97	22	17	4.6	11
19	27	89	495	33	28	197	83	84	21	4.4	5.5	10
20	27	75	472	33	28	322	86	75	20	7.4	5.8	12
21	27	161	373	34	28	536	95	89	20	7.4	5.2	12
22	26	191	283	35	28	890	93	103	22	6.6	6.6	9.1
23	25	113	197	36	28	1570	78	71	29	7.4	5.8	8.3
24	25	91	151	37	28	1910	71	55	23	7.4	5.2	8.0
25	23	102	110	38	28	1510	80	46	19	7.4	4.9	7.7
26	23	87	80	39	28	1240	74	40	17	7.0	4.9	6.9
27	23	80	60	40	28	1070	64	36	16	8.2	5.2	6.9
28	23	68	45	40	28	857	58	31	16	8.6	4.9	7.0
29	22	56	35	40	---	899	52	28	15	12	5.2	6.5
30	22	50	33	40	---	767	47	24	13	9.8	5.2	7.2
31	22	---	33	40	---	773	---	22	---	8.6	4.9	---
TOTAL	1167	2237	5642	1066	903	13454	8209	2469	718	317.4	186.0	196.3
MEAN	37.6	74.6	182	34.4	32.3	434	274	79.6	23.9	10.2	6.00	6.54
MAX	102	191	495	40	40	1910	990	317	67	17	8.2	12
MIN	22	21	33	32	28	28	47	22	13	6.6	4.6	2.4
CFSM	.25	.49	1.21	.23	.21	2.87	1.82	.53	.16	.07	.04	.04
IN.	.29	.55	1.39	.26	.22	3.31	2.02	.61	.18	.08	.05	.05
CAL YR 1977	TOTAL	20297.1	MEAN	55.6	MAX	495	MIN	4.5	CFSM	.37	IN	5.00
WTR YR 1978	TOTAL	36564.7	MEAN	100	MAX	1910	MIN	2.4	CFSM	.66	IN	9.01

## STREAMS TRIBUTARY TO LAKE ST. CLAIR

04160800 SASHABAW CREEK NEAR DRAYTON PLAINS, MI

LOCATION.--Lat 42°43'12", long 83°21'13", in SE¼ sec.26, T.4 N., R.9 E., Oakland County, Hydrologic Unit 04090003, on right bank 25 ft (8 m) upstream from bridge on Maybee Road, 1.1 mi (1.8 km) upstream from mouth, and 2.5 mi (4.0 km) northeast of Drayton Plains.

DRAINAGE AREA.--20.9 mi<sup>2</sup> (54.1 km<sup>2</sup>).

PERIOD OF RECORD.--October 1959 to current year.

REVISED RECORDS.--WSP 2112: Drainage area.

GAGE.--Water-stage recorder. Metal V-notch weir Aug. 30, 1961, to Mar. 6, 1968. Altitude of gage is 970 ft (296 m) from topographic map (nearest 10 ft).

REMARKS.--Records good except those for the winter period, which are fair. Several observations of water temperature were made during the year.

AVERAGE DISCHARGE.--19 years, 12.1 ft<sup>3</sup>/s (0.343 m<sup>3</sup>/s), 7.86 in/yr (200 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 161 ft<sup>3</sup>/s (4.56 m<sup>3</sup>/s) Feb. 23, 1974, gage height, 4.38 ft (1.335 m); minimum, 0.2 ft<sup>3</sup>/s (0.006 m<sup>3</sup>/s) on many days during 1961, 1963, 1964, 1965, 1966; minimum gage height, 1.59 ft (0.485 m) Aug. 1, 2, 1960.

EXTREMES FOR CURRENT YEAR.--Peak discharges above base of 45 ft<sup>3</sup>/s (1.27 m<sup>3</sup>/s) and maximum (\*):

Date	Time	Discharge (ft <sup>3</sup> /s) (m <sup>3</sup> /s)	Gage height (ft) (m)	Date	Time	Discharge (ft <sup>3</sup> /s) (m <sup>3</sup> /s)	Gage height (ft) (m)
Mar. 24	0800	*72 2.04	*3.57 1.088	Apr. 1	2200	52 1.47	3.27 0.997

Minimum discharge, 0.25 ft<sup>3</sup>/s (0.007 m<sup>3</sup>/s) Sept. 7, 8, 9, 10, gage height, 1.78 ft (0.543 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	5.9	2.7	17	8.2	9.4	6.8	50	13	10	6.6	1.8	.80
2	6.4	2.7	17	8.2	9.0	6.6	50	13	9.3	7.8	1.7	.74
3	5.0	2.8	14	8.2	8.6	6.8	48	12	8.8	7.5	3.4	.74
4	4.1	2.8	12	8.0	8.2	6.8	44	12	8.2	6.8	2.6	.63
5	3.6	2.7	11	7.8	8.3	6.7	42	13	8.1	6.4	2.1	.57
6	3.2	4.8	10	7.6	8.3	6.6	39	15	7.5	6.0	2.0	.49
7	3.0	7.2	9.0	7.6	8.3	6.4	39	14	7.5	5.7	2.2	.30
8	4.7	6.5	8.1	7.4	8.4	6.4	34	14	9.6	5.2	2.1	.30
9	5.2	6.4	8.6	7.3	8.4	6.3	31	18	9.3	4.9	1.9	.25
10	4.3	9.9	8.7	7.3	8.4	6.4	30	17	8.0	4.5	1.7	.30
11	4.5	8.8	9.4	7.2	8.2	6.7	31	15	6.9	3.8	1.6	.30
12	4.7	7.7	9.8	7.2	8.0	7.1	29	18	7.6	3.2	1.5	.55
13	4.3	7.1	9.2	7.1	8.2	8.1	27	31	9.1	2.5	1.4	1.6
14	4.1	7.6	14	7.0	7.8	12	25	40	7.7	2.6	1.3	2.0
15	4.1	7.6	16	7.0	7.4	14	23	33	6.8	2.2	1.2	2.1
16	4.3	9.1	16	7.0	7.4	15	21	27	6.4	2.0	1.3	2.0
17	3.8	11	17	7.0	7.4	15	20	23	6.2	1.7	1.2	2.7
18	3.6	10	20	6.8	7.2	17	20	21	5.7	1.4	1.1	4.5
19	3.6	8.9	23	6.4	7.0	16	21	19	5.4	1.5	1.5	4.3
20	3.4	12	23	6.6	6.8	19	25	20	5.2	1.4	1.2	3.4
21	3.2	15	25	7.0	6.6	35	25	26	16	1.6	1.0	3.0
22	3.2	12	19	7.2	6.4	42	22	22	12	1.6	1.0	2.7
23	3.2	11	17	7.0	6.4	46	20	20	9.2	1.6	.91	2.3
24	3.2	10	15	6.8	6.6	56	21	18	7.6	1.8	.93	2.0
25	3.0	9.9	14	8.0	6.6	47	20	16	7.0	1.7	.87	1.8
26	3.0	9.2	12	11	6.8	40	18	15	11	1.9	.90	1.7
27	3.0	8.4	11	12	6.8	39	17	14	10	2.7	1.0	1.8
28	2.7	7.7	11	11	6.9	36	16	13	8.2	2.2	1.3	1.8
29	2.7	7.2	9.8	11	---	39	15	11	7.2	2.2	1.2	1.7
30	2.7	7.5	9.2	10	---	35	14	11	7.2	1.9	.99	1.7
31	2.7	---	8.6	9.8	---	40	---	11	---	1.9	.88	---
TOTAL	118.4	236.2	424.4	247.7	213.8	650.7	837	565	248.7	104.8	45.78	49.07
MEAN	3.82	7.67	13.7	7.99	7.64	21.0	27.9	18.2	8.29	3.38	1.48	1.64
MAX	6.4	15	25	12	9.4	56	50	40	16	7.8	3.4	4.5
MIN	2.7	2.7	8.1	6.4	6.4	6.3	14	11	5.2	1.4	.87	.25
CFSM	.18	.38	.66	.38	.37	1.01	1.34	.87	.40	.16	.07	.08
IN.	.21	.42	.76	.44	.38	1.16	1.49	1.01	.44	.19	.08	.09

CAL YR 1977 TOTAL 2833.71 MEAN 7.76 MAX 41 MIN .25 CFSM .37 IN 5.04  
WTR YR 1978 TOTAL 3741.55 MEAN 10.3 MAX 56 MIN .25 CFSM .49 IN 6.66

## STREAMS TRIBUTARY TO LAKE ST. CLAIR

329

04160900 CLINTON RIVER NEAR DRAYTON PLAINS, MI

LOCATION.--Lat 42°39'37", long 83°23'25", in NE¼ sec.21, T.3 N., R.9 E., Oakland County, Hydrologic Unit 04090003, on left bank 14 ft (4 m) downstream from bridge on State Highway 59, 1.0 mi (1.6 km) downstream from State fish hatchery, and 2.0 mi (3.2 km) south of Drayton Plains.

DRAINAGE AREA.--79.2 mi<sup>2</sup> (205.1 km<sup>2</sup>).

PERIOD OF RECORD.--October 1959 to current year.

REVISED RECORDS.--WSP 2112: Drainage area.

GAGE.--Water-stage recorder. Altitude of gage is 940 ft (287 m) from topographic map (nearest 10 ft). Jan. 29 to July 9, 1964, non-recording gage at same site and datum.

REMARKS.--Records good. Some regulation and occasional diversion for lake level control at many lakes above station. Several observations of water temperature were made during the year.

AVERAGE DISCHARGE.--19 years, 50.9 ft<sup>3</sup>/s (1.441 m<sup>3</sup>/s), 8.73 in/yr (222 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 276 ft<sup>3</sup>/s (7.82 m<sup>3</sup>/s) Mar. 12, 1974, gage height, 4.95 ft (1.509 m); minimum, 2.4 ft<sup>3</sup>/s (0.068 m<sup>3</sup>/s) May 31, 1961; minimum gage height, 1.23 ft (0.375 m) Jan. 4, 1961.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 129 ft<sup>3</sup>/s (3.65 m<sup>3</sup>/s) May 21, gage height, 3.68 ft (1.122 m); minimum, 5.4 ft<sup>3</sup>/s (0.153 m<sup>3</sup>/s) Sept. 9, 10, 12, gage height, 1.91 ft (0.582 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	70	38	66	61	49	38	99	21	51	44	8.6	7.3
2	62	34	60	61	49	39	102	20	49	44	9.1	6.3
3	47	32	59	60	51	38	105	20	47	42	10	6.3
4	31	28	57	60	50	38	107	24	45	41	9.1	6.3
5	30	21	59	59	48	37	107	21	44	39	7.0	6.7
6	30	26	58	57	48	36	108	12	35	34	7.0	7.0
7	31	29	57	57	49	36	106	13	26	20	9.1	6.3
8	40	33	57	55	47	35	105	26	52	23	7.3	6.7
9	38	32	58	54	46	35	104	13	54	16	7.3	5.4
10	37	37	60	53	47	34	102	17	34	16	7.0	5.7
11	36	39	56	52	46	34	101	19	34	18	6.7	6.3
12	34	39	54	51	44	34	100	14	37	13	6.7	6.7
13	32	38	51	50	43	34	98	21	46	11	6.7	6.7
14	31	38	56	49	43	39	95	27	49	11	6.7	6.3
15	30	38	56	48	43	40	93	43	40	10	7.6	7.3
16	28	41	57	47	42	42	91	64	30	13	7.6	6.3
17	33	45	57	48	42	42	88	72	30	12	7.3	7.6
18	38	53	60	46	42	43	87	86	30	11	7.3	7.9
19	36	57	60	45	42	44	84	89	30	9.9	7.6	8.6
20	34	66	64	45	41	46	84	105	32	9.5	7.3	7.3
21	37	65	64	45	40	57	83	119	46	9.5	8.6	7.3
22	40	66	64	46	40	60	82	89	40	9.1	7.9	6.7
23	38	65	64	46	41	67	80	75	39	8.6	7.6	6.3
24	43	63	64	42	39	73	80	88	38	7.9	11	6.7
25	49	64	64	42	40	82	74	93	38	11	10	6.3
26	49	61	64	50	38	92	66	80	40	11	7.3	6.3
27	50	61	66	53	38	96	55	54	38	9.1	7.3	6.7
28	51	61	65	51	38	99	38	51	37	9.1	7.3	7.6
29	49	60	64	51	---	98	26	48	36	9.5	7.0	11
30	47	60	63	50	---	96	26	50	37	9.1	6.7	11
31	44	---	61	49	---	98	---	51	---	9.1	7.0	---
TOTAL	1245	1390	1865	1583	1226	1682	2576	1525	1184	540.4	240.7	210.9
MEAN	40.2	46.3	60.2	51.1	43.8	54.3	85.9	49.2	39.5	17.4	7.76	7.03
MAX	70	66	66	61	51	99	108	119	54	44	11	11
MIN	28	21	51	42	38	34	26	12	26	7.9	6.7	5.4
CFSM	.51	.59	.76	.65	.55	.69	1.09	.62	.50	.22	.10	.09
IN.	.58	.65	.88	.74	.58	.79	1.21	.72	.56	.25	.11	.10
CAL YR 1977	TOTAL	12819.9	MEAN	35.1	MAX	98	MIN	5.0	CFSM	.44	IN	6.02
WTR YR 1978	TOTAL	15268.0	MEAN	41.8	MAX	119	MIN	5.4	CFSM	.53	IN	7.17

## STREAMS TRIBUTARY TO LAKE ST. CLAIR

04161000 CLINTON RIVER AT AUBURN HEIGHTS, MI

LOCATION.--Lat 42°38'00", long 83°13'28", in NW¼ sec.36, T.3 N., R.10 E., Oakland County, Hydrologic Unit 04090003, on right bank 30 ft (9 m) upstream from bridge on Auburn Road at Auburn Heights, and 2.8 mi (4.5 km) upstream from Galloway Creek.

DRAINAGE AREA.--123 mi<sup>2</sup> (319 km<sup>2</sup>).

PERIOD OF RECORD.--May 1935 to June 1939 and February to September 1940 (published as "at Pontiac"), October 1956 to current year.

REVISED RECORDS.--WSP 1307: 1937 (M). WSP 1507: Drainage area at former site.

GAGE.--Water-stage recorder. Datum of gage is 846.50 ft (258.013 m) National Geodetic Vertical Datum of 1929. Prior to October 1940, nonrecording gage at site 3.3 mi (5.3 km) upstream at datum 876.01 ft (267.008 m) National Geodetic Vertical Datum of 1929.

REMARKS.--Records good. Some regulation by many lakes above station. Flow includes waste from city of Pontiac water supply, most of which is obtained from sources outside the basin. Several observations of water temperature were made during the year.

AVERAGE DISCHARGE.--25 years (water years 1936-38, 1957-78), 101 ft<sup>3</sup>/s (2.860 m<sup>3</sup>/s), 11.15 in/yr (283 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,720 ft<sup>3</sup>/s (48.7 m<sup>3</sup>/s) Apr. 19, 1975, gage height, 5.37 ft (1.637 m); minimum observed, 4.8 ft<sup>3</sup>/s (0.14 m<sup>3</sup>/s) Sept. 4, 1936, site then in use.

EXTREMES FOR CURRENT YEAR.--Peak discharges above base of 460 ft<sup>3</sup>/s (13.0 m<sup>3</sup>/s) and maximum (\*):

Date	Time	Discharge (ft <sup>3</sup> /s) (m <sup>3</sup> /s)		Gage height (ft) (m)		Date	Time	Discharge (ft <sup>3</sup> /s) (m <sup>3</sup> /s)		Gage height (ft) (m)	
Apr. 10	2300	522	14.8	3.15	0.960	June 21	0300	602	17.0	3.35	1.021
May 13	1000	*610	17.3	*3.39	1.033	Sept. 18	2000	518	14.7	3.15	0.960

Minimum discharge, 27 ft<sup>3</sup>/s (0.765 m<sup>3</sup>/s) Aug. 7, gage height, 0.94 ft (0.287 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT
1	168	96	230	132	102	96	215	126	124	122	35	37
2	106	90	170	132	110	94	193	67	119	113	44	36
3	78	88	146	134	119	96	218	52	104	95	52	37
4	47	91	134	139	117	94	213	54	78	89	39	32
5	43	87	135	140	112	88	215	78	72	89	36	34
6	55	152	141	141	113	94	217	59	53	94	33	41
7	125	111	136	133	113	95	220	47	53	67	34	58
8	185	105	127	128	115	96	226	105	73	62	35	43
9	118	100	138	125	113	101	221	86	96	59	39	41
10	112	180	137	125	119	114	248	60	103	57	34	43
11	124	150	134	129	113	106	271	57	94	53	33	39
12	112	120	136	127	109	119	226	87	118	50	35	78
13	109	110	143	125	110	120	215	225	103	46	30	85
14	110	100	212	107	112	238	211	131	98	49	32	60
15	78	105	140	94	111	149	208	102	92	47	36	52
16	74	115	139	97	113	127	202	102	95	40	40	45
17	72	125	138	98	114	121	199	127	66	40	38	101
18	103	120	172	97	112	112	200	137	55	43	56	160
19	83	110	141	98	107	128	231	124	52	46	44	81
20	101	150	165	101	107	147	262	145	53	39	35	54
21	96	160	157	104	111	296	212	117	168	46	37	91
22	99	130	154	97	95	214	200	176	118	41	36	73
23	89	120	155	92	97	194	196	186	110	38	37	74
24	93	115	155	99	98	184	199	145	87	35	37	68
25	91	110	160	101	97	165	179	146	109	36	41	68
26	90	110	142	141	89	210	157	147	121	42	37	72
27	90	110	136	113	93	192	138	138	90	41	37	72
28	91	105	133	97	93	192	137	136	104	38	36	60
29	89	100	133	94	---	183	139	128	117	42	37	59
30	86	110	134	99	---	195	132	155	118	35	38	55
31	87	---	134	101	---	220	---	142	---	34	36	---
TOTAL	3004	3475	4607	3540	3014	4580	6100	3587	2843	1728	1169	1849
MEAN	96.9	116	149	114	108	148	203	116	94.8	55.7	37.7	61.6
MAX	185	180	230	141	119	296	271	225	168	122	56	160
MIN	43	87	127	92	89	88	132	47	52	34	30	32
CAL YR 1977	TOTAL	35733	MEAN	97.9	MAX	341	MIN	32				
WTR YR 1978	TOTAL	39496	MEAN	108	MAX	296	MIN	30				



## STREAMS TRIBUTARY TO LAKE ST. CLAIR

331

04161100 GALLOWAY CREEK NEAR AUBURN HEIGHTS, MI

LOCATION.--Lat 42°40'02", long 83°12'02", in SE¼ sec.18, T.3 N., R.11 E., Oakland County, Hydrologic Unit 04090003, on right bank 12 ft (4 m) downstream from wooden bridge on Oakland University property, and 2.7 mi (4.3 km) northeast of Auburn Heights.

DRAINAGE AREA.--17.9 mi<sup>2</sup> (46.4 km<sup>2</sup>).

PERIOD OF RECORD.--October 1959 to current year.

REVISED RECORDS.--WSP 2112: Drainage area.

GAGE.--Water-stage recorder. Concrete control since Aug. 20, 1960. Datum of gage is 820.78 ft (250.174 m) National Geodetic Vertical Datum of 1929 (levels by Johnson and Anderson, Inc.).

REMARKS.--Records good except those for the winter period, which are fair. Several observations of water temperature were made during the year.

AVERAGE DISCHARGE.--19 years, 9.76 ft<sup>3</sup>/s (0.276 m<sup>3</sup>/s), 7.40 in/yr (188 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 368 ft<sup>3</sup>/s (10.4 m<sup>3</sup>/s) June 25, 1968, gage height, 6.27 ft (1.911 m); minimum, 0.01 ft<sup>3</sup>/s (<0.001 m<sup>3</sup>/s) on several days during July and August, 1964; minimum gage height, 0.82 ft (0.250 m) Aug. 1, 1960.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 100 ft<sup>3</sup>/s (2.83 m<sup>3</sup>/s) Mar. 21, gage height, 4.75 ft (1.448 m), only peak above base of 90.0 ft<sup>3</sup>/s (2.55 m<sup>3</sup>/s); minimum, 0.65 ft<sup>3</sup>/s (0.018 m<sup>3</sup>/s) Aug. 17; minimum gage height, 1.63 ft (0.497 m) Sept. 6, 7, 8.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	10	2.0	31	5.6	6.1	4.2	41	7.6	5.0	3.8	.99	.99
2	6.7	2.0	32	5.6	6.1	4.2	37	7.3	5.0	5.0	1.6	.99
3	5.2	1.9	22	5.8	6.1	4.2	34	6.7	4.4	4.3	1.9	.99
4	4.8	1.9	15	5.6	6.1	4.2	34	6.2	4.0	3.8	1.1	.99
5	3.5	1.8	11	5.4	6.1	4.2	33	8.2	4.5	3.4	.90	.99
6	2.9	6.6	9.9	5.3	6.1	4.2	29	9.0	4.0	3.1	.90	.90
7	2.5	9.6	8.2	5.2	6.0	4.2	28	8.2	4.3	2.7	.99	.90
8	8.0	12	6.7	5.2	5.8	4.2	23	12	7.0	2.4	1.1	.90
9	5.8	9.6	6.5	5.1	5.6	4.2	20	24	5.7	2.2	.99	.99
10	4.6	24	6.2	4.9	5.4	4.2	20	22	5.0	2.1	.99	1.1
11	4.2	17	6.2	4.8	5.0	4.4	36	17	4.4	1.8	.90	1.2
12	4.0	13	6.3	4.8	4.8	4.5	27	21	5.3	1.7	.99	2.3
13	3.5	9.7	6.7	4.7	4.6	5.0	22	48	5.9	1.6	.90	3.6
14	3.0	8.0	20	4.6	4.5	6.6	18	61	5.1	1.6	.90	2.8
15	2.9	7.5	25	4.5	4.4	9.2	15	48	4.7	1.5	.90	2.6
16	3.2	9.1	25	4.4	4.3	13	13	36	4.5	1.5	1.2	1.7
17	2.8	11	25	4.3	4.2	19	12	27	4.3	1.3	.90	4.5
18	2.6	11	33	4.2	4.2	22	11	22	3.8	1.2	1.1	9.0
19	2.3	9.0	35	4.2	4.2	35	14	18	3.4	1.3	1.5	5.1
20	2.2	14	33	4.2	4.2	54	29	17	3.1	1.3	1.4	2.6
21	2.1	20	29	4.2	4.2	92	23	21	10	1.6	1.1	2.8
22	1.9	15	22	4.2	4.2	87	19	17	7.0	1.4	1.1	2.3
23	1.8	12	18	4.4	4.2	83	16	14	5.7	1.2	1.1	1.9
24	1.6	11	15	4.6	4.2	71	16	12	4.7	1.1	1.1	1.7
25	1.6	9.6	12	5.0	4.2	54	14	10	5.4	.99	.99	1.4
26	1.6	9.2	10	5.3	4.2	48	13	9.0	9.7	.99	.99	1.3
27	1.6	7.4	8.6	5.5	4.2	49	11	7.8	7.3	1.1	1.1	1.5
28	1.6	7.0	7.6	5.7	4.2	44	9.9	6.8	5.7	.90	1.1	1.6
29	1.6	6.4	6.6	5.8	---	44	9.0	5.9	4.5	1.4	.90	1.4
30	1.5	6.2	6.2	5.9	---	35	8.3	5.6	3.7	.99	.90	1.5
31	1.5	---	5.9	6.0	---	37	---	5.7	---	.99	.90	---
TOTAL	103.1	284.5	504.6	155.0	137.4	858.7	635.2	541.0	157.1	60.26	33.43	62.54
MEAN	3.33	9.48	16.3	5.00	4.91	27.7	21.2	17.5	5.24	1.94	1.08	2.08
MAX	10	24	35	6.0	6.1	92	41	61	10	5.0	1.9	9.0
MIN	1.5	1.8	5.9	4.2	4.2	4.2	8.3	5.6	3.1	.90	.90	.90
CFSM	.19	.53	.91	.28	.27	1.55	1.18	.98	.29	.11	.06	.12
IN.	.21	.59	1.05	.32	.29	1.78	1.32	1.12	.33	.13	.07	.13
CAL YR 1977	TOTAL	3223.89	MEAN 8.83	MAX 79	MIN .87	CFSM .49	IN 6.70					
WTR YR 1978	TOTAL	3532.83	MEAN 9.68	MAX 92	MIN .90	CFSM .54	IN 7.34					

## STREAMS TRIBUTARY TO LAKE ST. CLAIR

04161540 PAINT CREEK AT ROCHESTER, MI

LOCATION.--Lat 42°41'18", long 83°08'35", in NW¼ SE¼ sec.10, T.3 N., R.11 E., Oakland County, Hydrologic Unit 04090003, on right bank at upstream side of bridge on Ludlow Street in Rochester, and 1.5 mi (2.4 km) upstream from mouth.

DRAINAGE AREA.--70.9 mi<sup>2</sup> (183.6 km<sup>2</sup>).

PERIOD OF RECORD.--October 1959 to current year.

REVISED RECORDS.--WSP 2112: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 755.11 ft (230.158 m) National Geodetic Vertical Datum of 1929.

REMARKS.--Records good except those for the winter period, which are fair. Occasional regulation by Lake Orion. Several observations of water temperature were made during the year.

AVERAGE DISCHARGE.--19 years, 51.1 ft<sup>3</sup>/s (1.447 m<sup>3</sup>/s), 9.79 in/yr (249 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 918 ft<sup>3</sup>/s (26.0 m<sup>3</sup>/s) Feb. 1, 1968; maximum gage height, 5.95 ft (1.814 m) Feb. 10, 1965, backwater from ice; minimum discharge, 1.2 ft<sup>3</sup>/s (0.034 m<sup>3</sup>/s) Aug. 19, 1974, caused by regulation due to bridge construction; minimum gage height, 1.26 ft (0.384 m) Sept. 16, 1960.

EXTREMES FOR CURRENT YEAR.--Peak discharges above base of 200 ft<sup>3</sup>/s (5.66 m<sup>3</sup>/s) and maximum (\*):

Date	Time	Discharge (ft <sup>3</sup> /s) (m <sup>3</sup> /s)	Gage height (ft) (m)	Date	Time	Discharge (ft <sup>3</sup> /s) (m <sup>3</sup> /s)	Gage height (ft) (m)
Mar. 23	2200	*270 7.65	*3.14 0.957	Mar. 28	2200	205 5.81	2.88 0.878

Minimum discharge, 11 ft<sup>3</sup>/s (0.312 m<sup>3</sup>/s) Aug. 17, 18, 25, gage height, 1.48 ft (0.451 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	51	22	85	40	43	31	190	42	37	29	17	20
2	43	22	67	40	43	31	176	40	32	34	19	17
3	34	22	54	40	44	31	172	38	50	32	21	15
4	40	22	47	41	44	31	176	36	45	34	18	14
5	35	22	44	41	44	31	184	43	39	32	16	15
6	31	35	41	41	44	31	174	45	24	29	15	30
7	29	42	39	39	43	31	160	46	23	26	17	28
8	42	39	37	37	42	31	141	60	31	24	18	27
9	37	37	37	36	41	31	130	80	29	22	16	25
10	32	65	37	35	40	31	128	60	35	23	15	25
11	30	49	39	34	38	31	139	54	29	21	15	28
12	29	43	42	34	35	32	116	70	28	19	14	50
13	27	39	45	33	34	34	98	118	33	19	14	59
14	25	37	71	33	33	36	87	127	29	19	13	54
15	30	38	68	32	32	40	80	114	29	20	12	52
16	30	43	65	32	31	45	75	101	27	19	13	46
17	28	45	65	31	30	50	71	95	34	19	13	53
18	27	43	71	30	30	56	68	88	31	19	12	61
19	25	39	76	30	30	67	77	78	28	18	17	49
20	24	51	78	30	30	87	85	76	25	17	18	42
21	23	57	76	30	30	215	78	87	49	17	20	42
22	22	46	68	30	31	220	71	72	35	17	17	38
23	21	43	62	31	31	240	67	62	32	15	21	36
24	20	42	59	33	31	210	66	57	29	15	14	34
25	21	41	54	35	31	162	46	51	34	15	14	32
26	22	41	51	36	31	178	47	48	40	15	13	30
27	22	40	49	39	31	192	49	43	36	21	13	30
28	21	38	45	40	31	192	49	39	31	19	20	30
29	21	37	43	41	---	186	48	36	32	19	26	29
30	21	39	42	42	---	156	46	43	29	20	25	29
31	22	---	40	42	---	166	---	46	---	19	22	---
TOTAL	885	1179	1697	1108	998	2905	3094	1995	985	667	518	1040
MEAN	28.5	39.3	54.7	35.7	35.6	93.7	103	64.4	32.8	21.5	16.7	34.7
MAX	51	65	85	42	44	240	190	127	50	34	26	61
MIN	20	22	37	30	30	31	46	36	23	15	12	14
CFSM	.40	.55	.77	.50	.50	1.32	1.45	.91	.46	.30	.24	.49
IN.	.46	.62	.89	.58	.52	1.52	1.62	1.05	.52	.35	.27	.55

CAL YR 1977	TOTAL	14401	MEAN 39.5	MAX 176	MIN 12	CFSM .56	IN 7.56
WTR YR 1978	TOTAL	17071	MEAN 46.8	MAX 240	MIN 12	CFSM .66	IN 8.96

STREAMS TRIBUTARY TO LAKE ST. CLAIR

333

04161580 STONY CREEK NEAR ROMBO, MI

LOCATION.--Lat 42°48'03", long 83°05'25", in SW<sub>4</sub> sec.31, T.5 N., R.12 E., Macomb County, Hydrologic Unit 04090003, on right bank at upstream side of bridge on Romeo Road, and 4.0 mi (6.4 km) west of Romeo.

DRAINAGE AREA.--25.6 mi<sup>2</sup> (66.3 km<sup>2</sup>).

PERIOD OF RECORD.--October 1964 to current year.

GAGE.--Water-stage recorder. Datum of gage is 861.64 ft (262.628 m) National Geodetic Vertical Datum of 1929.

REMARKS.--Records good except those for the winter period, which are fair. Several observations of water temperature were made during the year.

AVERAGE DISCHARGE.--14 years, 17.8 ft<sup>3</sup>/s (0.504 m<sup>3</sup>/s), 9.44 in/yr (240 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 290 ft<sup>3</sup>/s (8.21 m<sup>3</sup>/s) Apr. 19, 1975, gage height, 5.19 ft (1.582 m); minimum, 0.92 ft<sup>3</sup>/s (0.026 m<sup>3</sup>/s) Oct. 5, 9, 1967; minimum gage height, 1.28 ft (0.390 m) July 27, 28, 1965.

EXTREMES FOR CURRENT YEAR.--Peak discharges above base of 100 ft<sup>3</sup>/s (2.83 m<sup>3</sup>/s) and maximum (\*):

Date	Time	Discharge (ft <sup>3</sup> /s) (m <sup>3</sup> /s)	Gage height (ft) (m)	Date	Time	Discharge (ft <sup>3</sup> /s) (m <sup>3</sup> /s)	Gage height (ft) (m)
Mar. 25	0800	*137 3.88	*3.99 1.216	Apr. 1	1000	100 2.83	3.63 1.106

Minimum discharge, 1.4 ft<sup>3</sup>/s (0.040 m<sup>3</sup>/s) Sept. 3, 5, gage height, 1.39 ft (0.424 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	28	5.7	25	10	12	9.0	93	8.0	7.5	4.4	3.8	2.2
2	29	9.7	24	10	12	8.8	96	7.7	6.9	6.8	3.8	1.9
3	20	9.7	18	10	11	8.8	85	7.1	6.3	5.6	5.1	1.8
4	20	8.8	14	9.9	11	8.8	79	6.7	5.7	5.1	4.7	2.1
5	19	2.1	11	9.8	12	8.8	78	9.6	5.8	5.4	4.1	1.8
6	16	6.2	10	9.6	12	8.6	71	11	5.4	5.3	3.9	1.7
7	14	14	11	9.6	11	8.6	65	9.1	5.6	4.8	3.5	1.8
8	19	9.0	10	9.4	11	8.4	58	12	8.6	4.9	3.4	1.8
9	20	16	10	9.4	11	8.2	51	24	7.5	4.1	3.2	1.8
10	16	24	11	9.4	11	8.6	46	17	7.1	3.8	3.1	1.9
11	13	20	12	9.3	11	9.0	49	14	6.3	3.7	3.0	2.1
12	14	16	15	9.3	11	9.4	45	19	6.9	3.5	2.9	2.5
13	12	12	18	9.3	10	10	38	33	8.1	3.5	2.7	4.0
14	10	11	19	9.2	10	13	33	34	6.6	3.6	2.5	4.8
15	9.8	11	20	9.2	9.6	17	32	30	5.9	3.5	2.8	5.6
16	10	16	21	9.0	9.8	18	30	27	5.7	3.4	3.0	3.9
17	7.8	17	22	9.0	9.8	18	26	30	5.9	3.3	2.7	3.7
18	6.2	14	26	9.0	9.5	18	24	23	5.8	3.5	2.7	4.2
19	6.0	12	24	8.5	9.2	18	27	18	5.1	3.6	3.1	3.9
20	5.4	17	22	8.6	8.8	24	30	25	4.6	3.6	3.2	4.2
21	4.6	21	19	9.0	8.7	43	29	32	10	3.9	2.7	4.3
22	4.1	15	17	9.4	8.6	50	25	24	14	4.2	2.5	4.0
23	4.0	14	15	9.0	8.6	74	22	19	12	3.9	2.2	3.4
24	3.4	15	14	9.0	8.6	100	23	16	6.2	3.6	2.1	3.6
25	3.7	14	13	10	8.6	107	21	13	4.8	3.3	2.2	3.3
26	13	13	12	15	8.8	82	18	11	5.8	3.9	2.2	3.1
27	14	9.2	12	16	9.0	79	16	10	5.2	5.6	2.2	3.2
28	12	9.2	11	14	9.0	75	14	9.1	4.5	4.7	2.4	3.3
29	7.4	9.4	11	14	---	74	10	8.3	4.1	4.7	2.5	8.9
30	5.7	9.9	11	13	---	69	8.7	7.8	3.8	4.4	2.4	10
31	5.4	---	11	13	---	76	---	8.6	---	3.7	2.2	---
TOTAL	372.5	380.9	489	318.9	282.6	1070.0	1242.7	524.0	197.7	131.3	92.8	104.8
MEAN	12.0	12.7	15.8	10.3	10.1	34.5	41.4	16.9	6.59	4.24	2.99	3.49
MAX	29	24	26	16	12	107	96	34	14	6.8	5.1	10
MIN	3.4	2.1	10	8.5	8.6	8.2	8.7	6.7	3.8	3.3	2.1	1.7
CFSM	.47	.50	.62	.40	.40	1.35	1.62	.66	.26	.17	.12	.14
IN.	.54	.55	.71	.46	.41	1.55	1.81	.76	.29	.19	.13	.15
CAL YR 1977	TOTAL	4601.1	MEAN	12.6	MAX	63	MIN	2.1	CFSM	.49	IN	6.69
WTR YR 1978	TOTAL	5207.2	MEAN	14.3	MAX	107	MIN	1.7	CFSM	.56	IN	7.57

## STREAMS TRIBUTARY TO LAKE ST. CLAIR

04161790 STONY LAKE NEAR WASHINGTON, MI

LOCATION.--Lat 42°42'58", long 83°05'58", in SE¼ sec.31, T.4 N., R.12 E., Macomb County, Hydrologic Unit 04090003, on left bank 1,000 ft (305 m) east of bridge over dam on Stony Creek, and 2.7 mi (4.3 km) west of Washington.

DRAINAGE AREA.--68.0 mi<sup>2</sup> (176.1 km<sup>2</sup>).

PERIOD OF RECORD.--February 1963 to current year.

REVISED RECORDS.--WDR MI-77-1: 1976.

GAGE.--Water-stage recorder. Datum of gage is 790.00 ft (240.792 m) National Geodetic Vertical Datum of 1929 (levels by Huron-Clinton Metropolitan Authority). Gage readings have been converted to elevations NGVD.

REMARKS.--Reservoir is formed by an earthfill dam with concrete spillway completed in 1962. The spillway section includes a drum gate with minimum crest elevation of 796 ft (242.6 m), maximum of 802 ft (244.4 m); and 2 sluices, one on each side, with valve controls capable of draining lake. Total capacity (new capacity table put into use Oct. 1, 1973), 4,649 acre-ft (5.73 hm<sup>3</sup>) at elevation of 802 ft (244.4 m). The reservoir began filling February 1963. Lake is used for recreational purposes.

EXTREMES FOR PERIOD OF RECORD.--Maximum contents, 5,495 acre-ft (6.78 hm<sup>3</sup>) May 17, 18, 1974, Apr. 20, 1975, elevation 803.6 ft (244.94 m); minimum recorded, 1,758 acre-ft (2.17 hm<sup>3</sup>) Nov. 21, 1967, elevation, 794.7 ft (242.22 m).

EXTREMES FOR CURRENT YEAR.--Maximum contents, 5,065 acre-ft (6.25 hm<sup>3</sup>) Apr. 1, May 14, elevation, 802.8 ft (244.69 m); minimum, 3,329 acre-ft (4.10 hm<sup>3</sup>) Jan. 12 to 27, Feb. 18 to Mar. 24, elevation, 799.2 ft (243.60 m).

## MONTHEND ELEVATION AND CONTENTS AT 2400, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

Date	Elevation (feet)	Contents (acre-feet)	Change in contents during month	
			Acre-feet	Equivalent in ft <sup>3</sup> /s
Sept. 30 . . . . .	801.8	4549	--	--
Oct. 31 . . . . .	801.7	4499	-50	-0.8
Nov. 30 . . . . .	799.6	3505	-994	-16.7
Dec. 31 . . . . .	799.4	3417	-88	-1.4
CAL YR 1977 . . . . .	--	--	-496	-0.7
Jan. 31 . . . . .	799.3	3373	-44	-0.7
Feb. 28 . . . . .	799.2	3329	-44	-0.8
Mar. 31 . . . . .	802.4	4857	+1528	+24.8
Apr. 30 . . . . .	802.3	4805	-52	-0.9
May 31 . . . . .	802.3	4805	0	0
June 30 . . . . .	802.1	4701	-104	-1.7
July 31 . . . . .	802.0	4649	-52	-0.8
Aug. 31 . . . . .	802.0	4649	0	0
Sept. 30 . . . . .	802.1	4701	+52	+0.9
WTR YR 1978 . . . . .	--	--	+152	+0.2

## 04161800 STONY CREEK NEAR WASHINGTON, MI

LOCATION.--Lat 42°42'55", long 83°05'31", in SW¼ sec.31, T.4 N., R.12 E., Macomb County, Hydrologic Unit 04090003, on left bank 15 ft (5 m) downstream from bridge on Mt. Vernon Road, 500 ft (152 m) downstream from Stony Lake Dam, and 2.9 mi (4.7 km) west of Washington.

DRAINAGE AREA.--68.2 mi<sup>2</sup> (176.6 km<sup>2</sup>).

PERIOD OF RECORD.--July 1958 to current year.

REVISED RECORDS.--WSP 2112: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 772.59 ft (235.485 m) National Geodetic Vertical Datum of 1929 (levels by Huron-Clinton Metropolitan Authority).

REMARKS.--Records good. Occasional diurnal fluctuation caused by mills above station prior to February 1963; occasional regulation by Stony Lake since (station 04161790). Several observations of water temperature were made during the year.

AVERAGE DISCHARGE.--20 years, 41.6 ft<sup>3</sup>/s (1.178 m<sup>3</sup>/s), 8.28 in/yr (210 mm/yr), adjusted for storage since 1963.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 427 ft<sup>3</sup>/s (12.1 m<sup>3</sup>/s) Feb. 2, 1968, gage height, 5.86 ft (1.786 m); maximum gage height, 6.71 ft (2.045 m) Mar. 6, 1959, backwater from ice; minimum discharge, 0.9 ft<sup>3</sup>/s (0.025 m<sup>3</sup>/s) July 10, 1963; minimum gage height, 1.84 ft (0.561 m) July 31, 1964; minimum daily discharge, 1.3 ft<sup>3</sup>/s (0.037 m<sup>3</sup>/s) July 31, Aug. 1, 1964.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 321 ft<sup>3</sup>/s (9.09 m<sup>3</sup>/s) Nov. 22, gage height, 5.38 ft (1.640 m); minimum, 3.7 ft<sup>3</sup>/s (0.105 m<sup>3</sup>/s) Sept. 9, 10; minimum gage height, 1.87 ft (0.570 m) Mar. 27, Sept. 9, 10.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	46	18	82	34	39	28	133	25	28	16	7.8	4.3
2	45	18	71	33	38	27	177	23	27	21	8.3	4.4
3	43	19	64	33	36	29	192	24	24	22	11	6.0
4	35	27	52	32	34	28	182	24	21	20	9.7	4.3
5	32	21	48	32	36	28	173	27	22	19	9.2	4.3
6	30	27	40	31	37	28	165	32	19	19	9.2	4.0
7	28	37	35	31	36	27	157	33	20	18	9.5	4.1
8	35	39	35	31	36	27	142	37	25	18	9.5	4.4
9	38	37	39	30	35	26	123	53	24	15	9.5	4.2
10	35	51	33	30	35	27	115	59	23	15	9.2	3.9
11	33	52	35	30	34	28	123	62	21	12	8.1	3.9
12	30	50	49	30	33	29	113	68	23	10	7.8	6.4
13	27	42	56	30	34	31	103	78	26	10	7.8	6.9
14	25	37	60	29	32	44	92	94	23	11	7.4	9.2
15	26	62	61	29	31	54	78	104	21	11	7.0	14
16	27	65	65	29	31	59	71	92	21	11	6.8	14
17	22	63	69	29	31	58	68	80	22	8.1	6.6	16
18	21	74	82	29	30	57	63	72	22	7.4	6.4	22
19	21	50	78	27	29	57	67	63	21	7.6	8.3	22
20	19	39	71	27	28	65	77	61	18	8.3	7.6	18
21	19	70	62	29	28	106	74	72	27	13	6.4	17
22	21	144	55	30	27	148	67	67	25	13	6.2	14
23	18	134	51	29	27	191	64	57	25	12	6.0	11
24	17	71	43	28	27	219	48	53	24	10	6.4	10
25	17	53	40	30	28	211	42	48	22	9.5	6.8	11
26	18	45	38	46	28	208	37	43	26	9.5	5.0	8.5
27	19	35	37	52	28	65	30	37	26	11	5.3	9.3
28	21	34	36	46	29	35	24	32	22	8.8	5.3	9.1
29	23	100	35	44	---	37	17	29	19	10	5.4	8.3
30	21	116	35	42	---	57	24	28	18	9.2	4.8	8.9
31	18	---	34	41	---	64	---	31	---	7.4	5.8	---
TOTAL	830	1630	1591	1023	897	2098	2841	1608	685	392.8	230.1	283.4
MEAN	26.8	54.3	51.3	33.0	32.0	67.7	94.7	51.9	22.8	12.7	7.42	9.45
MAX	46	144	82	52	39	219	192	104	28	22	11	22
MIN	17	18	33	27	27	26	17	23	18	7.4	4.8	3.9
MEAN+	26.0	37.6	49.9	32.3	31.2	92.5	93.8	51.9	21.1	11.9	7.42	10.3
CFSM+	0.38	0.55	0.73	0.47	0.46	1.36	1.38	0.76	0.31	0.17	0.11	0.15
IN+	0.44	0.62	0.84	0.55	0.48	1.56	1.53	0.88	0.35	0.20	0.13	0.17

CAL YR 1977 TOTAL 13067.1 MEAN 35.8 MAX 144 MIN 6.0 MEAN+ 35.1 CFSM+ 0.51 IN+ 6.99  
 WTR YR 1978 TOTAL 14109.3 MEAN 38.7 MAX 219 MIN 3.9 MEAN+ 38.9 CFSM+ 0.57 IN+ 7.73  
 +Adjusted for change in contents in Stony Lake.



## STREAMS TRIBUTARY TO LAKE ST. CLAIR

04162900 BIG BEAVER CREEK NEAR WARREN, MI

LOCATION.--Lat 42°32'31", long 83°02'52", in NW¼ SW¼ sec.33, T.2 N., R.12 E., Macomb County, Hydrologic Unit 04090003, on left bank between bridges on Mound Road, 1.0 mi (1.6 km) north of Warren, and 2.0 mi (3.2 km) upstream from mouth.

DRAINAGE AREA.--23.5 mi<sup>2</sup> (60.9 km<sup>2</sup>).

PERIOD OF RECORD.--October 1958 to current year.

GAGE.--Water-stage recorder. Datum of gage is 598.80 ft (182.514 m) National Geodetic Vertical Datum of 1929 (Macomb County bench mark). Prior to Aug. 26, 1960, nonrecording gage and crest-stage gage at same site and datum.

REMARKS.--Records fair except those for the winter period, which are poor. Several observations of water temperature were made during the year.

AVERAGE DISCHARGE.--20 years, 12.9 ft<sup>3</sup>/s (0.365 m<sup>3</sup>/s), 7.45 in/yr (189 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,240 ft<sup>3</sup>/s (35.1 m<sup>3</sup>/s) June 26, 1968, gage height, 14.45 ft (4.404 m); no flow on several days in June and July 1962, caused by unusual regulation above gage; minimum natural discharge, 0.03 ft<sup>3</sup>/s (0.001 m<sup>3</sup>/s) Sept. 26, 1974.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 76 ft<sup>3</sup>/s (2.15 m<sup>3</sup>/s) Mar. 21, gage height, 6.39 ft (1.948 m); maximum gage height, 6.86 ft (2.091 m) Mar. 14, backwater from ice; no peak above base of 300 ft<sup>3</sup>/s (8.50 m<sup>3</sup>/s); minimum discharge, 0.05 ft<sup>3</sup>/s (0.001 m<sup>3</sup>/s) Aug. 28, Sept. 6; minimum gage height, 4.73 ft (1.442 m) Feb. 20, 21, 22, 23, result of freezeup.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	21	.34	33	.35	.30	.30	2.1	.82	1.0	3.5	.13	.13
2	4.5	.39	2.9	.35	.30	.30	2.3	.82	.97	2.9	.16	.13
3	1.9	.34	2.0	.30	.30	.30	8.0	1.4	1.2	.80	.27	.13
4	1.1	.38	1.0	.30	.32	.30	8.0	.82	.53	.44	.29	.12
5	.75	.49	.90	.30	.32	.30	7.2	3.1	1.1	.31	.13	.11
6	.53	6.0	.90	.30	.32	.30	9.7	2.1	.81	1.0	.14	.09
7	.34	3.6	.87	.25	.32	.30	13	.94	1.3	.41	.69	.10
8	9.9	1.3	.90	.25	.32	.30	1.9	14	1.5	.21	.42	.13
9	2.5	.84	.90	.25	.32	.30	1.2	15	.81	.18	2.1	.16
10	1.0	.18	.90	.25	.32	.30	7.2	4.9	.40	.16	3.2	.16
11	1.3	1.8	1.0	.25	.32	.40	18	1.2	.25	.14	.23	.22
12	.80	.57	1.5	.25	.32	.60	2.6	4.0	9.3	.17	.28	.97
13	.57	.31	2.0	.25	.32	6.0	1.7	32	3.2	.25	.24	7.1
14	.65	.27	25	.25	.33	45	4.5	32	.47	.25	.11	16
15	.42	.88	13	.25	.33	40	1.3	15	1.2	.21	.08	6.4
16	.55	2.4	6.0	.25	.33	20	.83	8.1	.59	.20	.20	2.3
17	.52	3.1	3.5	.25	.33	10	.78	2.1	.32	.16	.17	16
18	.43	1.3	5.0	.25	.33	6.0	1.2	1.9	.21	.25	.12	30
19	.46	.60	6.8	.25	.33	6.0	4.3	1.2	.18	.78	.68	22
20	.56	7.3	15	.25	.33	7.0	28	7.2	.18	.51	.33	14
21	.50	3.6	10	.25	.33	51	5.3	4.9	15	.67	.12	1.0
22	.82	.79	5.2	.25	.33	17	2.3	1.9	3.6	.41	.24	.37
23	.51	.54	1.3	.25	.33	13	1.5	1.2	.61	.30	1.1	.35
24	.45	.57	1.2	.25	.30	7.7	2.6	2.2	.37	.23	.26	.65
25	.38	.40	1.0	.25	.30	1.7	3.4	.90	6.2	.22	.11	.43
26	.58	.30	.70	.25	.30	13	1.4	.75	28	.30	.09	.27
27	.36	.25	.60	.25	.30	8.0	1.1	.75	8.5	.77	.07	.89
28	.31	.24	.50	.27	.30	8.5	.94	.71	.92	.15	.06	1.3
29	.33	.22	.50	.28	---	2.8	.82	.68	.54	.68	.13	.85
30	.33	2.5	.45	.30	---	2.3	.82	9.1	.63	.20	.08	.51
31	.31	---	.40	.30	---	2.8	---	8.5	---	.15	.20	---
TOTAL	54.66	59.62	144.92	8.30	8.90	271.80	143.99	180.19	89.89	16.91	12.43	122.87
MEAN	1.76	1.99	4.67	.27	.32	8.77	4.80	5.81	3.00	.55	.40	4.10
MAX	21	18	33	.35	.33	51	28	32	28	3.5	3.2	30
MIN	.31	.22	.40	.25	.30	.30	.78	.68	.18	.14	.06	.09
CFSM	.08	.09	.20	.01	.01	.37	.20	.25	.13	.02	.02	.17
IN.	.09	.09	.23	.01	.01	.43	.23	.29	.14	.03	.02	.19
CAL YR 1977	TOTAL	1658.42	MEAN	4.54	MAX	71	MIN	.08	CFSM	.19	IN	2.63
WTR YR 1978	TOTAL	1114.48	MEAN	3.05	MAX	51	MIN	.06	CFSM	.13	IN	1.76

## 04163400 PLUM BROOK AT UTICA, MI

LOCATION.--Lat 42°36'05", long 83°04'27", in SE¼ NE¼ sec.7, T.2 N., R.12 E., Macomb County, Hydrologic Unit 04090003, on left bank at upstream side of bridge on Ryan Road, 1.0 mi (1.6 km) southwest of Utica.

DRAINAGE AREA.--16.5 mi<sup>2</sup> (42.7 km<sup>2</sup>).

PERIOD OF RECORD.--July 1965 to current year.

REVISED RECORDS.--WSP 2112: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 619.79 ft (188.912 m) National Geodetic Vertical Datum of 1929 (levels by Johnson & Anderson Inc.).

REMARKS.--Records good except those for the winter period, which are fair. Occasional diversion for sprinkler irrigation. Several observations of water temperature were made during the year.

AVERAGE DISCHARGE.--13 years, 12.8 ft<sup>3</sup>/s (0.362 m<sup>3</sup>/s), 10.53 in/yr (267 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,160 ft<sup>3</sup>/s (32.9 m<sup>3</sup>/s) June 26, 1968, gage height, 10.36 ft (3.158 m); no flow part of each day July 19, 28, 1966, Aug. 22-28, Sept. 3, 11, 1969; minimum gage height, 1.23 ft (0.375 m) Sept. 16, 1967.

EXTREMES FOR CURRENT YEAR.--Peak discharges above base of 200 ft<sup>3</sup>/s (5.66 m<sup>3</sup>/s) and maximum (\*):

Date	Time	Discharge (ft <sup>3</sup> /s) (m <sup>3</sup> /s)	Gage height (ft) (m)	Date	Time	Discharge (ft <sup>3</sup> /s) (m <sup>3</sup> /s)	Gage height (ft) (m)
Mar. 15	--	270 7.65	ice jam	Mar. 21	1400	*282 7.99	*6.97 2.124

Minimum discharge, 0.01 ft<sup>3</sup>/s (<0.001 m<sup>3</sup>/s) Sept. 8, 9, gage height, 1.50 ft (0.457 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	13	1.4	35	4.1	3.7	3.1	29	8.1	8.1	2.8	.59	1.3
2	9.5	1.6	15	3.9	3.7	3.1	23	7.0	9.1	5.9	.47	.47
3	6.7	2.2	9.0	3.7	3.7	3.1	30	6.2	5.5	3.8	1.0	.25
4	3.2	1.9	7.0	3.5	3.7	3.1	32	5.5	3.8	2.5	.57	.17
5	2.0	1.9	6.0	3.4	3.7	3.1	31	11	5.2	2.5	.35	.35
6	3.6	13	5.6	3.4	3.6	3.1	30	11	3.0	2.6	.35	.89
7	4.0	16	5.2	3.3	3.6	3.1	30	9.8	5.2	1.7	.41	.84
8	6.8	6.8	4.8	3.3	3.5	3.1	23	13	14	1.3	1.1	.07
9	8.5	4.6	4.5	3.3	3.5	3.1	21	23	9.3	1.2	4.5	.11
10	4.9	26	4.5	3.2	3.5	3.1	24	14	2.8	1.2	1.7	.14
11	3.0	11	4.6	3.2	3.5	3.5	44	10	2.2	.88	.81	.74
12	2.6	5.3	6.0	3.1	3.5	4.0	30	16	4.6	.85	.51	1.9
13	2.5	3.7	8.0	3.1	3.4	5.0	22	41	3.2	.83	.45	6.3
14	2.0	3.3	35	3.0	3.3	30	19	41	2.1	.68	.41	8.8
15	1.8	3.7	27	3.0	3.3	190	18	33	1.9	.71	.50	16
16	1.8	9.0	23	3.0	3.3	140	16	23	2.0	.66	1.4	3.7
17	1.7	9.4	28	3.0	3.3	115	15	19	2.1	.62	1.0	11
18	1.6	7.1	31	3.0	3.3	88	16	15	2.0	.61	.21	36
19	2.8	4.6	34	3.0	3.2	85	19	11	1.7	.56	1.1	28
20	2.3	10	34	3.1	3.2	90	37	14	1.5	1.9	1.5	12
21	1.6	17	31	3.2	3.2	221	23	20	12	2.1	1.7	12
22	2.1	8.4	23	3.3	3.2	108	17	15	4.3	1.1	1.7	5.5
23	2.0	5.9	20	3.4	3.2	85	14	9.2	2.1	.90	.48	2.3
24	1.8	6.1	19	3.4	3.1	47	19	8.1	1.6	.68	.46	1.6
25	2.1	6.0	23	3.4	3.1	31	15	7.3	3.6	.64	.30	1.1
26	1.8	5.0	16	3.5	3.1	41	11	5.1	22	.58	.30	.92
27	1.5	4.6	10	3.6	3.1	51	8.8	5.8	10	.67	.64	.96
28	1.7	4.5	6.0	3.6	3.1	35	7.8	4.3	7.5	.47	.65	2.3
29	1.6	4.7	5.5	3.6	---	30	7.1	4.2	3.2	1.2	.49	1.1
30	1.4	6.8	4.9	3.6	---	25	6.9	8.6	1.6	.80	.40	1.1
31	1.4	---	4.4	3.7	---	27	---	17	---	.59	.50	---
TOTAL	103.3	211.5	490.0	103.9	94.6	1482.5	638.6	436.2	157.2	43.53	26.55	157.91
MEAN	3.33	7.05	15.8	3.35	3.38	47.8	21.3	14.1	5.24	1.40	.86	5.26
MAX	13	26	35	4.1	3.7	221	44	41	22	5.9	4.5	36
MIN	1.4	1.4	4.4	3.0	3.1	3.1	6.9	4.2	1.5	.47	.21	.07
CFSM	.20	.43	.96	.20	.21	2.90	1.29	.86	.32	.09	.05	.32
IN.	.23	.48	1.10	.23	.21	3.34	1.44	.98	.35	.10	.06	.36

CAL YR 1977 TOTAL 4168.87 MEAN 11.4 MAX 221 MIN .11 CFSM .69 IN 9.40  
WTR YR 1978 TOTAL 3945.79 MEAN 10.8 MAX 221 MIN .07 CFSM .66 IN 8.90

## STREAMS TRIBUTARY TO LAKE ST. CLAIR

04164000 CLINTON RIVER NEAR FRASER, MI

LOCATION.--Lat 42°34'40", long 82°57'00", in NW¼ sec.20, T.2 N., R.13 E., Macomb County, Hydrologic Unit 04090003, on left bank 800 ft (244 m) downstream from bridge on Garfield Road, 2.8 mi (4.5 km) north of Fraser, and 4.0 mi (6.4 km) upstream from North Branch.

DRAINAGE AREA.--444 mi<sup>2</sup> (1,150 km<sup>2</sup>).

PERIOD OF RECORD.--May 1947 to current year.

REVISED RECORDS.--WSP 2112: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 577.71 ft (176.086 m) National Geodetic Vertical Datum of 1929. Prior to Nov. 17, 1949, nonrecording gage at site 800 ft (244 m) upstream at same datum.

REMARKS.--Records good. Several observations of water temperature were made during the year. National Weather Service gage-height telemark at station.

AVERAGE DISCHARGE.--31 years, 368 ft<sup>3</sup>/s (10.42 m<sup>3</sup>/s), 11.26 in/yr (286 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 8,000 ft<sup>3</sup>/s (227 m<sup>3</sup>/s) May 11, 1948, gage height, 19.5 ft (5.94 m), from graph based on gage readings, from rating curve extended above 4,000 ft<sup>3</sup>/s (113 m<sup>3</sup>/s); minimum, 47 ft<sup>3</sup>/s (1.33 m<sup>3</sup>/s) Sept. 6, 1955; minimum gage height, 4.29 ft (1.308 m) Sept. 7, 1954.

EXTREMES OUTSIDE PERIOD OF RECORD.--Flood of April 5 or 6, 1947, reached a stage of 20 ft (6.1 m), from floodmarks, discharge, 9,000 ft<sup>3</sup>/s (255 m<sup>3</sup>/s), from rating curve extended above 4,000 ft<sup>3</sup>/s (113 m<sup>3</sup>/s).

EXTREMES FOR CURRENT YEAR.--Peak discharges above base of 2,000 ft<sup>3</sup>/s (56.6 m<sup>3</sup>/s) and maximum (\*):

Date	Time	Discharge (ft <sup>3</sup> /s) (m <sup>3</sup> /s)	Gage height (ft) (m)	Date	Time	Discharge (ft <sup>3</sup> /s) (m <sup>3</sup> /s)	Gage height (ft) (m)
Mar. 14	2100	*2590 73.3	*14.04 4.279	Mar. 21	1400	2200 62.3	13.40 4.084

Minimum discharge, 95 ft<sup>3</sup>/s (2.69 m<sup>3</sup>/s) Sept. 5, gage height, 5.03 ft (1.533 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT
1	748	201	1080	285	269	227	719	305	327	284	142	124
2	471	204	663	274	278	219	720	291	353	370	143	119
3	295	197	452	302	253	225	843	234	291	254	242	110
4	243	195	390	291	253	227	877	222	263	236	166	105
5	207	204	339	301	257	210	897	326	264	215	148	102
6	189	250	347	303	258	209	851	317	225	222	145	124
7	203	382	331	285	261	226	961	252	209	207	213	131
8	500	324	313	292	261	226	750	351	264	180	213	146
9	401	270	295	292	264	244	671	678	236	163	218	137
10	280	617	298	290	259	295	642	408	246	157	241	129
11	287	410	284	295	262	336	1060	331	233	160	146	139
12	295	300	290	290	253	427	794	425	295	147	133	228
13	257	258	360	286	252	515	637	795	344	144	127	354
14	242	240	1110	268	251	1540	569	973	248	144	117	470
15	227	267	878	223	256	1630	522	739	234	143	128	462
16	228	348	607	215	262	933	476	598	231	139	143	255
17	206	370	566	225	247	770	463	506	231	129	144	423
18	208	340	632	234	240	576	466	501	192	139	130	640
19	231	293	759	231	238	623	576	459	174	144	155	624
20	202	402	739	227	225	828	1090	471	174	143	174	319
21	224	502	725	231	234	1760	668	590	608	162	128	252
22	232	363	536	231	235	1640	540	446	327	189	136	273
23	215	392	480	216	221	1390	479	459	254	141	138	233
24	193	352	445	234	224	1150	512	421	240	136	141	218
25	205	309	496	253	230	933	452	373	275	137	127	197
26	202	315	370	505	237	949	410	354	763	129	131	198
27	206	242	352	423	227	1040	370	336	358	189	118	209
28	207	239	315	346	235	802	342	314	270	147	119	240
29	196	244	304	302	---	723	319	289	254	184	143	191
30	197	366	309	291	---	635	314	385	248	151	134	177
31	191	---	293	289	---	675	---	584	---	131	131	---
TOTAL	8188	9396	15358	8730	6942	22183	18990	13733	8631	5416	4714	7329
MEAN	264	313	495	282	248	716	633	443	288	175	152	244
MAX	748	617	1110	505	278	1760	1090	973	763	370	242	640
MIN	189	195	284	215	221	209	314	222	174	129	117	102
CFSM	.60	.71	1.12	.64	.56	1.61	1.43	1.00	.65	.39	.34	.55
IN.	.69	.79	1.29	.73	.58	1.86	1.59	1.15	.72	.45	.39	.61

CAL YR 1977	TOTAL	126584	MEAN 347	MAX 2500	MIN 104	CFSM .78	IN 10.61
WTR YR 1978	TOTAL	129610	MEAN 355	MAX 1760	MIN 102	CFSM .80	IN 10.86

## STREAMS TRIBUTARY TO LAKE ST. CLAIR

339

## 04164100 EAST POND CREEK AT ROMEO, MI

LOCATION.--Lat 42°49'21", long 83°01'13", in NE¼ Sec. 27, T.5 N., R.12 E., Macomb County, Hydrologic Unit 04090003, on right bank 10 ft (3 m) upstream from bridge on State Highway 53, and 1.4 mi (2.3 km) north of Romeo.

DRAINAGE AREA.--21.8 mi<sup>2</sup> (56.5 km<sup>2</sup>).

PERIOD OF RECORD.--September 1958 to current year.

GAGE.--Water-stage recorder. Altitude of gage is 780 ft (238 m) from topographic map (nearest 10 ft).

REMARKS.--Records good except those for the winter period, which are fair. Several observations of water temperature were made during the year.

AVERAGE DISCHARGE.--20 years, 15.3 ft<sup>3</sup>/s (0.433 m<sup>3</sup>/s), 9.53 in/yr (242 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 358 ft<sup>3</sup>/s (10.1 m<sup>3</sup>/s) Feb. 10, 1965, gage height, 4.48 ft (1.366 m); maximum gage height, 4.56 ft (1.390 m) Mar. 12, 1962, backwater from ice; minimum discharge, 0.8 ft<sup>3</sup>/s (0.023 m<sup>3</sup>/s) July 30, 31, 1964, Aug. 6, 7, 1965; minimum gage height, 0.71 ft (0.216 m) July 21, 1959.

EXTREMES FOR CURRENT YEAR.--Peak discharges above base of 80 ft<sup>3</sup>/s (2.27 m<sup>3</sup>/s) and maximum (\*):

Date	Time	Discharge (ft <sup>3</sup> /s) (m <sup>3</sup> /s)	Gage height (ft) (m)	Date	Time	Discharge (ft <sup>3</sup> /s) (m <sup>3</sup> /s)	Gage height (ft) (m)
Mar. 24	0800	*117 3.31	*2.66 0.811	Mar. 25	0800	113 3.20	2.63 0.802

Minimum discharge, 1.8 ft<sup>3</sup>/s (0.051 m<sup>3</sup>/s) Sept. 9; minimum gage height, 0.91 ft (0.277 m) Aug. 26, 30, Sept. 6, 7, 8, 9.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	18	6.6	24	10	12	9.5	66	16	12	3.4	3.8	2.5
2	19	6.5	26	10	12	9.5	68	15	11	4.7	3.9	2.4
3	14	6.6	21	10	12	9.5	68	13	10	4.4	5.1	2.2
4	10	6.5	18	10	12	9.0	63	12	9.5	4.7	4.2	2.2
5	9.1	6.3	15	10	12	9.0	63	13	9.4	4.6	3.9	2.3
6	8.3	10	13	10	11	9.0	58	13	8.8	4.2	4.1	2.2
7	7.6	14	11	10	11	9.0	54	7.4	8.8	13	4.4	2.0
8	13	17	10	9.5	11	9.0	46	18	10	15	4.6	2.1
9	16	15	10	9.5	11	9.0	41	24	9.4	5.7	4.0	2.0
10	13	21	11	9.5	11	9.0	39	21	8.5	4.1	4.2	2.2
11	12	18	13	9.5	11	9.0	43	19	7.8	4.1	3.9	2.5
12	11	16	15	9.5	11	10	38	20	9.0	3.8	3.6	2.9
13	9.7	14	18	9.5	11	12	32	29	10	3.4	3.3	4.3
14	9.0	14	19	9.5	10	14	29	32	9.2	3.6	3.1	4.4
15	8.9	14	21	9.5	10	17	25	29	8.7	3.6	3.0	5.1
16	10	15	21	9.0	10	18	24	26	8.0	3.6	3.0	3.2
17	9.5	16	22	9.0	10	18	22	24	4.5	3.6	2.7	3.7
18	9.2	15	25	9.0	10	19	22	24	4.9	3.4	2.6	9.6
19	9.0	14	23	9.0	9.5	20	25	22	10	3.4	2.8	8.4
20	8.5	19	22	9.0	9.5	38	27	22	4.2	3.4	2.8	6.7
21	7.9	23	20	9.0	9.0	60	25	25	9.1	4.5	2.7	2.7
22	7.5	18	18	9.0	9.0	73	24	22	4.3	3.8	2.8	2.6
23	7.2	17	16	9.0	8.5	90	23	20	3.7	3.8	2.7	2.6
24	7.1	17	14	9.5	8.5	93	24	19	3.6	3.9	2.5	2.6
25	6.8	16	13	10	8.5	94	22	18	6.6	3.6	2.5	2.3
26	6.5	14	12	15	9.0	69	21	17	20	4.0	2.5	2.4
27	6.5	11	12	17	9.0	64	19	15	15	5.8	2.5	2.3
28	6.5	10	12	15	9.5	58	18	14	9.9	5.0	2.7	2.5
29	6.5	10	11	14	---	59	17	13	6.4	4.8	2.6	2.3
30	6.5	14	11	13	---	53	17	13	2.9	4.5	2.4	2.6
31	6.3	---	11	13	---	56	---	14	---	4.0	2.4	---
TOTAL	300.1	414.5	508	324.5	288.0	1025.5	1063	589.4	255.2	147.4	101.3	97.8
MEAN	9.68	13.8	16.4	10.5	10.3	33.1	35.4	19.0	8.51	4.75	3.27	3.26
MAX	19	23	26	17	12	93	68	32	20	15	5.1	9.6
MIN	6.3	6.3	10	9.0	8.5	9.0	17	7.4	2.9	3.4	2.4	2.0
CFSM	.44	.63	.75	.48	.47	1.52	1.62	.87	.39	.22	.15	.15
IN.	.51	.71	.87	.55	.49	1.75	1.81	1.01	.44	.25	.17	.17

CAL YR 1977 TOTAL 4387.2 MEAN 12.0 MAX 57 MIN 2.5 CFSM .55 IN 7.49  
WTR YR 1978 TOTAL 5114.7 MEAN 14.0 MAX 93 MIN 2.0 CFSM .64 IN 8.73

## STREAMS TRIBUTARY TO LAKE ST. CLAIR

04164300 EAST BRANCH COON CREEK AT ARMADA, MI

LOCATION.--Lat 42°50'45", long 82°53'06", in NE¼ sec.23, T.5 N., R.13 E., Macomb County, Hydrologic Unit 04090003, on right bank 10 ft (3 m) downstream from bridge on Prospect Street in Armada.

DRAINAGE AREA.--13.0 mi<sup>2</sup> (33.7 km<sup>2</sup>).

PERIOD OF RECORD.--October 1958 to current year.

GAGE.--Water-stage recorder and concrete control. Altitude of gage is 735 ft (224 m) from topographic map (nearest 5 ft).

REMARKS.--Records good except those for the winter period, which are fair. Several observations of water temperature were made during the year.

AVERAGE DISCHARGE.--20 years, 6.61 ft<sup>3</sup>/s (0.187 m<sup>3</sup>/s), 6.90 in/yr (175 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 910 ft<sup>3</sup>/s (25.8 m<sup>3</sup>/s) Apr. 19, 1975, gage height, 6.69 ft (2.039 m); no flow Jan. 25 to Feb. 10, 1961, result of freezeup.

EXTREMES FOR CURRENT YEAR.--Peak discharges above base of 100 ft<sup>3</sup>/s (2.83 m<sup>3</sup>/s) and maximum (\*):

Date	Time	Discharge (ft <sup>3</sup> /s) (m <sup>3</sup> /s)	Gage height (ft) (m)	Date	Time	Discharge (ft <sup>3</sup> /s) (m <sup>3</sup> /s)	Gage height (ft) (m)
Dec. 19	0500	109 3.09	2.87 0.875	Mar. 25	--	160 4.53	ice jam
Mar. 23	--	*400 11.3	*4.87 1.484	Mar. 31	2400	162 4.59	3.29 1.003
Mar. 24	--	260 7.36	ice jam				

a Ice jam.

Minimum discharge, 0.01 ft<sup>3</sup>/s (<0.001 m<sup>3</sup>/s) Oct. 22, 24, 25, Sept. 6; minimum gage height, 1.17 ft (0.357 m) Sept. 6.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1.3	.22	7.8	1.6	1.0	.69	147	1.6	1.4	.29	.10	.03
2	.31	.18	24	1.5	1.0	.69	67	1.5	1.2	.24	.15	.02
3	.58	.18	14	1.4	1.0	.69	43	1.4	1.2	.24	.18	.04
4	.44	.27	7.0	1.3	1.0	.69	54	1.3	1.1	.20	.10	.08
5	.19	.29	4.2	1.3	1.0	.69	53	1.5	.91	.20	.05	.07
6	.11	.93	2.9	1.2	.98	.69	33	1.5	.83	.17	.05	.02
7	.07	.47	2.2	1.1	.98	.69	36	1.4	.83	.14	.06	.03
8	.63	.39	2.4	1.0	.94	.69	17	1.7	.83	.14	.05	.06
9	.29	.34	2.1	.96	.90	.69	10	5.3	.69	.11	.05	.08
10	.19	1.4	.99	.90	.84	.70	8.7	6.0	.69	.14	.06	.10
11	.22	.82	1.3	.80	.80	.74	31	3.9	.62	.11	.07	.06
12	.18	1.1	1.1	.74	.78	.90	16	4.2	.62	.12	.08	.16
13	.13	1.4	1.2	.72	.74	1.1	9.2	25	.62	.13	.07	.25
14	.11	1.1	3.7	.70	.72	4.0	5.9	27	.56	.11	.07	1.1
15	.10	1.0	6.2	.70	.70	6.0	4.8	20	.50	.11	.07	.47
16	.09	1.1	13	.70	.70	8.0	4.2	11	.50	.11	.09	.23
17	.08	1.0	32	.70	.70	11	3.8	6.4	.50	.10	.09	.30
18	.06	.99	57	.70	.70	15	3.5	5.0	.44	.10	.09	.64
19	.06	1.0	91	.70	.70	20	4.4	4.1	.39	.08	.32	.18
20	.04	2.3	58	.70	.70	40	4.9	3.8	.34	.08	.15	.14
21	.04	3.2	37	.74	.69	115	4.4	4.5	1.2	.22	.11	.18
22	.04	4.4	21	.76	.69	150	3.6	3.5	.62	.10	.08	.13
23	.05	4.6	10	.80	.69	225	3.1	2.9	.50	.08	.08	.10
24	.05	3.4	7.0	.84	.69	175	3.6	2.5	.44	.07	.04	.06
25	.04	2.6	5.6	.90	.69	90	3.3	2.4	.39	.07	.04	.08
26	.11	2.1	4.5	.92	.69	73	2.9	2.0	.50	.23	.03	.06
27	.14	1.9	3.5	.96	.69	71	2.6	1.7	.39	.34	.07	.08
28	.15	1.6	2.8	.98	.69	70	2.3	1.4	.29	.11	.09	.08
29	.16	1.4	2.1	1.0	---	84	2.1	1.3	.24	.15	.06	.06
30	.17	1.3	1.8	1.0	---	49	1.9	1.2	.20	.14	.05	.08
31	.14	---	1.7	1.0	---	93	---	.99	---	.12	.04	---
TOTAL	6.27	42.98	429.09	29.32	22.40	1308.65	586.2	157.99	19.54	4.55	2.64	4.97
MEAN	.20	1.43	13.8	.95	.80	42.2	19.5	5.10	.65	.15	.085	.17
MAX	1.3	4.6	91	1.6	1.0	225	147	27	1.4	.34	.32	1.1
MIN	.04	.18	.99	.70	.69	.69	1.9	.99	.20	.07	.03	.02
CFSM	.02	.11	1.06	.07	.06	3.25	1.50	.39	.05	.01	.007	.01
IN.	.02	.12	1.23	.08	.06	3.74	1.68	.45	.06	.01	.01	.01
CAL YR 1977	TOTAL	1087.71	MEAN 2.98	MAX 91	MIN .01	CFSM .23	IN 3.11					
WTR YR 1978	TOTAL	2614.60	MEAN 7.16	MAX 225	MIN .02	CFSM .55	IN 7.48					



## STREAMS TRIBUTARY TO LAKE ST. CLAIR

341

04164500 NORTH BRANCH CLINTON RIVER NEAR MOUNT CLEMENS, MI

LOCATION.--Lat 42°37'45", long 82°53'25", in SW $\frac{1}{4}$  sec.35, T.3 N., R.13 E., Macomb County, Hydrologic Unit 04090003, on left bank 30 ft (9 m) upstream from bridge on State Highway 59, 2 mi (3 km) north of Mount Clemens, and 3.6 mi (5.8 km) upstream from mouth.

DRAINAGE AREA.--199 mi<sup>2</sup> (515 km<sup>2</sup>).

PERIOD OF RECORD.--May 1947 to current year.

REVISED RECORDS.--WSP 1437: 1948. WSP 1557: Drainage area.

GAGE.--Water-stage recorder. Concrete control since September 1961. Datum of gage is 576.38 ft (175.681 m) National Geodetic Vertical Datum of 1929 (levels by Michigan Department of Natural Resources). Prior to Nov. 15, 1949, nonrecording gage at same site and datum.

REMARKS.--Records good except those for the winter period, which are fair. Some regulation at times by mill above station. Several observations of water temperature were made during the year. National Weather Service gage-height telemark at station.

AVERAGE DISCHARGE.--31 years, 120 ft<sup>3</sup>/s (3.398 m<sup>3</sup>/s), 8.19 in/yr (208 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 6,700 ft<sup>3</sup>/s (190 m<sup>3</sup>/s) Feb. 2, 1968, gage height, 18.62 ft (5.675 m); minimum, 0.2 ft<sup>3</sup>/s (0.006 m<sup>3</sup>/s) Sept. 13, 14, 1954, July 30, 1965; minimum gage height, 3.12 ft (0.951 m) Sept. 13, 14, 1954.

EXTREMES OUTSIDE PERIOD OF RECORD.--Flood of Apr. 5 or 6, 1947, reached a stage of 20.0 ft (6.10 m), from floodmark.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 2,060 ft<sup>3</sup>/s (58.3 m<sup>3</sup>/s) Mar. 22, gage height, 13.85 ft (4.221 m), only peak above base of 1,200 ft<sup>3</sup>/s (34.0 m<sup>3</sup>/s); minimum, 0.22 ft<sup>3</sup>/s (0.006 m<sup>3</sup>/s) Sept. 8, 9, 10, gage height, 3.75 ft (1.143 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	18	16	66	45	38	33	550	72	53	16	6.6	.94
2	26	15	200	42	38	33	711	67	47	17	5.6	.58
3	49	16	235	40	38	32	718	63	44	20	5.6	.67
4	40	15	160	38	38	32	543	57	41	21	6.6	1.0
5	28	15	83	37	38	32	509	58	38	19	7.1	1.0
6	22	16	70	36	38	32	506	69	35	18	7.1	.49
7	18	16	55	35	38	32	463	75	34	17	6.2	.30
8	18	38	45	34	38	32	429	70	35	16	6.6	.75
9	20	43	39	33	37	32	315	124	39	17	7.1	.22
10	30	38	37	33	37	35	225	167	39	15	6.2	.33
11	31	58	37	32	37	44	272	137	33	11	5.3	.49
12	28	66	37	32	37	56	346	113	29	8.4	3.4	.58
13	24	49	41	32	36	74	296	189	29	7.9	3.6	1.5
14	22	39	66	32	36	90	201	399	33	7.9	3.1	8.8
15	20	35	156	31	36	125	153	435	30	7.5	3.1	19
16	18	34	267	31	35	170	131	330	27	7.5	2.2	21
17	19	39	329	31	35	250	118	216	25	7.1	2.0	14
18	19	45	376	31	35	350	109	155	25	5.3	1.5	20
19	19	43	421	32	35	450	113	131	22	4.3	2.2	35
20	18	40	485	32	34	700	187	114	20	4.3	2.7	24
21	18	51	474	32	34	1310	205	119	22	4.7	4.6	17
22	18	87	392	33	34	1990	157	131	31	10	3.4	14
23	17	73	276	34	33	1960	126	108	29	11	1.5	10
24	17	58	199	34	33	1790	114	93	22	8.8	.94	8.4
25	18	57	157	35	33	1380	122	83	20	6.2	1.5	7.5
26	17	53	120	36	33	977	114	72	24	4.7	1.5	6.6
27	16	37	94	36	33	807	100	61	36	4.3	1.7	5.9
28	16	37	74	37	33	763	89	54	30	6.6	1.8	7.0
29	16	37	64	37	---	682	83	47	24	8.8	2.4	6.0
30	16	36	58	37	---	660	77	44	19	9.2	1.5	6.0
31	16	---	50	38	---	566	---	45	---	8.8	1.5	---
TOTAL	672	1202	5163	1078	1000	15519	8082	3898	935	330.3	116.14	238.56
MEAN	21.7	40.1	167	34.8	35.7	501	269	126	31.2	10.7	3.75	7.95
MAX	49	87	485	45	38	1990	718	435	53	21	7.1	35
MTN	16	15	37	31	33	32	77	44	19	4.3	.94	.22
CFSM	.11	.20	.84	.18	.18	2.52	1.35	.63	.16	.05	.02	.04
IN.	.13	.22	.97	.20	.19	2.90	1.51	.73	.17	.06	.02	.04

CAL YR 1977 TOTAL 28727.60 MEAN 78.7 MAX 926 MIN 1.8 CFSM .40 IN 5.37  
WTH YR 1978 TOTAL 38234.00 MEAN 105 MAX 1990 MIN .22 CFSM .53 IN 7.15

LOCATION.--Lat 42°42'23", long 82°57'33", in SW<sub>4</sub> sec.5, T.3 N., R.13 E., Macomb County, Hydrologic Unit 04090003, on left bank at downstream side of bridge on Romeo Plank Road, 0.4 mi (0.6 km) north of Macomb.

PERIOD OF RECORD.--Water years 1959-62, 1969 (annual maximum and occasional low-flow measurements), October 1962 to September 1968, October 1969 to current year.

REMARKS.--Records good except those for the winter period, which are fair. Several observations of water temperature were made during the year.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,580 ft<sup>3</sup>/s (44.7 m<sup>3</sup>/s) June 26, 1968; maximum gage height, 16.16 ft (4.926 m) Mar. 12, 1962, backwater from ice; minimum discharge, 0.10 ft<sup>3</sup>/s (0.003 m<sup>3</sup>/s) July 22, 1971; minimum gage height, 4.68 ft (1.426 m) July 11, 1964.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 623 ft<sup>3</sup>/s (17.6 m<sup>3</sup>/s) Mar. 21, gage height, 10.51 ft (3.203 m), only peak above base of 300 ft<sup>3</sup>/s (8.50 m<sup>3</sup>/s); minimum, 0.34 ft<sup>3</sup>/s (0.010 m<sup>3</sup>/s) Sept. 6, 7, 8, gage height, 4.88 ft (1.487 m).

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	23	6.2	46	13	12	9.6	103	14	12	8.4	2.7	1.0
2	11	6.2	36	12	12	9.6	63	13	15	12	2.4	.87
3	6.2	6.2	22	12	12	9.6	77	12	12	9.1	2.8	.75
4	5.5	7.3	17	11	11	9.6	84	11	9.7	8.8	1.7	.68
5	5.2	6.2	14	11	11	9.6	80	20	10	8.2	1.5	.64
6	5.2	14	13	10	11	9.6	73	21	8.3	7.5	1.5	.58
7	5.2	12	13	10	11	9.6	85	16	9.1	6.5	1.7	.54
8	14	9.0	12	10	11	9.6	54	24	13	5.4	2.4	.40
9	9.8	6.9	12	9.8	11	10	47	56	10	5.1	1.5	.54
10	6.9	29	12	9.6	11	10	47	37	8.0	4.4	1.7	.57
11	6.2	12	12	9.6	11	12	97	27	6.7	4.5	1.3	.76
12	5.8	9.4	12	9.6	11	16	58	36	6.8	4.1	1.3	1.9
13	5.9	7.3	14	9.0	11	24	45	107	7.6	4.4	1.3	6.5
14	5.2	6.9	16	9.6	11	74	38	87	6.4	4.7	1.2	7.5
15	5.2	8.5	21	9.5	11	48	35	65	6.5	3.8	1.1	11
16	6.2	12	35	9.5	11	70	32	45	6.5	3.7	1.3	3.5
17	5.9	12	56	9.5	10	100	29	35	6.9	3.6	1.2	5.1
18	5.2	11	68	9.6	10	140	29	32	6.9	3.3	1.2	16
19	5.5	8.5	65	9.6	10	190	40	26	6.5	3.4	2.2	14
20	5.8	25	70	9.8	10	260	51	27	6.3	3.3	3.8	5.3
21	5.5	26	59	10	10	400	44	41	18	4.7	1.5	4.6
22	5.5	14	38	10	9.8	329	35	27	8.6	6.4	1.2	4.5
23	5.5	12	33	10	9.8	291	30	22	7.2	3.9	1.2	3.8
24	5.5	14	31	11	9.8	153	35	19	6.6	3.7	1.1	3.3
25	6.2	13	26	11	9.8	77	32	15	8.0	3.4	1.1	3.2
26	6.6	12	22	11	9.8	132	25	13	17	3.0	1.1	2.8
27	6.2	12	20	11	9.8	134	22	12	10	3.6	1.1	2.6
28	5.5	12	19	11	9.6	110	21	11	3.1	3.2	1.1	3.6
29	5.5	12	17	11	---	99	19	9.7	6.9	3.6	1.1	3.2
30	5.5	20	15	11	---	70	17	15	6.1	3.6	.99	5.5
31	6.9	---	14	12	---	91	---	28	---	2.9	1.0	---
TOTAL	213.3	362.6	900	323.3	297.4	2877.0	1447	923.7	270.7	156.7	48.29	115.36
MEAN	6.88	12.1	29.0	10.4	10.6	92.8	48.2	29.8	9.02	5.05	1.56	3.85
MAX	23	29	86	13	12	400	103	107	18	12	3.8	16
MIN	5.2	6.2	12	9.5	9.6	9.6	17	9.7	6.1	2.9	.99	.49
CFSM	.17	.30	.71	.25	.26	2.26	1.18	.73	.22	.12	.04	.09
IN.	.19	.33	.82	.29	.27	2.61	1.31	.84	.25	.14	.04	.10
CAL YR 1977	TOTAL	8214.20	MEAN	22.5	MAX	348	MIN	1.2	CFSM	.55	IN	7.45
WTR YR 1978	TOTAL	7935.35	MEAN	21.7	MAX	400	MIN	.49	CFSM	.53	IN	7.2

## STREAMS TRIBUTARY TO LAKE ST. CLAIR

343

04165500 CLINTON RIVER AT MOUNT CLEMENS, MI  
(National stream-quality accounting network and pesticide station)

LOCATION.--Lat 42°35'45", long 82°54'35", Macomb County, Hydrologic Unit 04090003, on left bank 20 ft (6 m) downstream from bridge on Moravian Drive, 0.2 mi (0.3 km) downstream from North Branch, and 0.5 mi (0.8 km) west of Mount Clemens.

DRAINAGE AREA.--734 mi<sup>2</sup> (1,901 km<sup>2</sup>).

## WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--May 1934 to current year.

REVISED RECORDS.--WSP 1084: 1943, 1945-46. WSP 1937: 1935, 1936(M), 1937-39, 1949(M), 1950. WSP 1557: Drainage area. WSP 1727: 1952(M), 1954(M).

GAGE.--Water-stage recorder. Datum of gage is 570.43 ft (173.867 m) National Geodetic Vertical Datum of 1929. May 10, 1934, to Jan. 11, 1939, nonrecording gage at same site and datum. Auxiliary gage is a water-stage recorder on right bank 2.0 mi (3.2 km) downstream from base gage at same datum. Mar. 15, 1938, to Jan. 3, 1952, auxiliary nonrecording gage 1.6 mi (2.6 km) downstream from base gage at same datum.

REMARKS.--Water-discharge records good except those for the winter period, which are fair. National Weather Service gage-height telemark at station.

AVERAGE DISCHARGE.--44 years, 523 ft<sup>3</sup>/s (14.81 m<sup>3</sup>/s), 9.68 in/yr (246 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 21,200 ft<sup>3</sup>/s (600 m<sup>3</sup>/s) Apr. 6, 1947, gage height, 23.55 ft (7.178 m), from flood-mark; minimum not determined; minimum gage height, 2.72 ft (0.829 m) Nov. 29, 1963.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 4,380 ft<sup>3</sup>/s (124 m<sup>3</sup>/s) Mar. 22, gage height, 11.14 ft (3.395 m), only peak above base of 3,000 ft<sup>3</sup>/s (85.0 m<sup>3</sup>/s); minimum daily, 115 ft<sup>3</sup>/s (3.26 m<sup>3</sup>/s) Sept. 4, 5; minimum gage height, 4.81 ft (1.466 m) Nov. 4.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	884	230	1280	390	390	299	1460	450	433	305	150	130
2	604	238	935	380	400	301	1570	410	440	432	164	125
3	432	264	721	400	370	289	1710	360	366	297	235	120
4	367	230	606	390	370	303	1620	330	329	272	164	115
5	266	327	450	400	370	289	1620	440	325	257	168	115
6	279	361	420	400	370	276	1500	430	299	262	170	120
7	337	502	400	380	370	293	1680	390	274	251	190	145
8	622	422	380	380	380	282	1330	500	344	206	190	150
9	522	393	370	390	380	308	1100	900	302	203	200	145
10	350	758	370	480	380	359	985	700	302	175	282	140
11	350	530	370	580	370	425	1600	540	281	183	169	180
12	350	435	390	500	370	508	1340	620	330	187	157	252
13	310	400	534	400	360	655	1080	1100	417	181	152	354
14	280	374	1320	350	360	1560	892	1500	295	166	133	488
15	270	379	1260	310	370	2160	778	1300	290	168	154	562
16	260	435	1020	300	359	1400	705	1100	280	165	179	312
17	250	476	1020	310	357	1200	671	840	277	145	153	433
18	250	418	1130	310	360	1210	677	760	234	160	148	713
19	270	416	1370	310	372	1350	813	660	219	167	169	736
20	250	567	1430	310	350	1860	1580	680	227	161	189	391
21	260	636	1450	310	338	3330	1120	800	674	181	151	288
22	270	527	1070	320	357	4230	864	700	392	200	159	298
23	260	524	845	300	326	3950	729	629	301	168	160	257
24	240	449	746	310	304	3510	749	579	286	159	145	241
25	240	427	766	414	298	2730	725	505	288	146	146	212
26	240	421	600	699	317	2230	640	479	894	151	140	216
27	240	430	500	533	316	2250	580	436	448	200	130	239
28	230	260	470	485	317	1830	520	401	325	145	130	266
29	230	318	450	420	---	1650	490	366	291	186	145	213
30	240	461	430	410	---	1430	460	420	273	165	140	207
31	240	---	410	410	---	1400	---	750	---	143	135	---
TOTAL	10193	12608	23513	12281	9981	43867	31588	20075	10436	6187	5097	8163
MEAN	329	420	758	396	356	1415	1053	648	348	200	164	272
MAX	884	758	1450	699	400	4230	1710	1500	894	432	282	736
MIN	230	230	370	300	298	276	460	330	219	143	130	115
CFSM	.45	.57	1.03	.54	.49	1.93	1.44	.88	.47	.27	.22	.37
IN.	.52	.64	1.19	.62	.51	2.22	1.60	1.02	.53	.31	.26	.41

CAL YR 1977 TOTAL 184312 MEAN 505 MAX 4100 MIN 115 CFSM .69 IN 9.34  
WTR YR 1978 TOTAL 193989 MEAN 531 MAX 4230 MIN 115 CFSM .72 IN 9.83

## STREAMS TRIBUTARY TO LAKE ST. CLAIR

04165500 CLINTON RIVER AT MOUNT CLEMENS, MI--CONTINUED

## WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1975 to current year.

PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE: October 1974 to current year.

WATER TEMPERATURES: October 1974 to current year.

INSTRUMENTATION.--Water-quality monitor since Aug. 13, 1975.

REMARKS.--Interruptions in daily record were due to malfunctions of the instrument.

COOPERATION.--Pesticide samples were collected by the U.S. Geological Survey and were analyzed by Environmental Protection Agency.

EXTREMES FOR PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE (water years 1975, 1976, 1978): Maximum, 3,580 micromhos Jan. 26, 1978; minimum, 126 micromhos, July 29, 1976.

WATER TEMPERATURES: Maximum, 29.5°C Sept. 20, 1978; minimum, 0.0°C on many days during winter periods.

EXTREMES FOR CURRENT YEAR.--

SPECIFIC CONDUCTANCE: Maximum, 3,580 micromhos Jan. 26, minimum, 344 micromhos Mar. 22.

WATER TEMPERATURES: Maximum, 29.5°C Sept. 20; minimum, 0.0°C on many days during winter period.

## WATER QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DATE	TIME	STREAM- FLOW, INSTAN- TANEOUS (CFS)	SPE- CIFIC CON- DUCT- ANCE (MICRO- MHOS)	PH (UNITS)	TEMPER- ATURE (DEG C)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION)	COLI- FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML)	STREP- TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML)	HARD- NESS (MG/L AS CAC03)	HARD- NESS, NONCAR- BONATE (MG/L CAC03)
OCT											
20...	1200	250	764	7.9	11.0	8.5	78	630	440	250	70
NOV											
15...	1530	379	754	8.2	6.5	7.3	60	K690	670	270	90
DEC											
15...	1130	1260	1030	7.9	3.5	--	--	2300	>2000	250	91
JAN											
18...	1045	310	1110	8.0	.0	12.2	85	380	120	310	95
FEB											
15...	1145	370	1092	8.1	.5	11.7	82	140	100	290	87
MAR											
15...	1230	2100	794	7.7	1.0	11.7	83	K110000	K12000	180	58
APR											
18...	1130	613	805	8.0	9.5	10.6	95	F220	K60	270	82
MAY											
18...	1145	760	819	8.1	17.0	8.8	92	420	F77	290	91
JUN											
13...	1200	402	714	8.0	15.5	5.2	52	K10000	K12000	230	79
JUL											
14...	1045	82	918	8.0	22.0	6.0	70	K940	240	260	96
AUG											
22...	1215	113	808	8.2	21.5	7.0	80	K600	K200	220	72
SEP											
19...	1230	799	468	7.8	20.0	6.0	66	K17000	K13000	170	43

K--Results based on colony count outside the acceptable range (non-ideal colony count)

E--Estimated value

DATE	CALCIUM DIS- SOLVED (MG/L AS CA)	MAGNE- SIUM, DIS- SOLVED (MG/L AS MG)	SODIUM, DIS- SOLVED (MG/L AS NA)	SODIUM AD- SORP- TION RATIO	SODIUM PERCENT	POTAS- SIUM, DIS- SOLVED (MG/L AS K)	BICAR- BONATE (MG/L AS HC03)	CAR- BONATE (MG/L AS CO3)	ALKA- LINITY (MG/L AS CAC03)	CARBON DIOXIDE DIS- SOLVED (MG/L AS CO2)	SULFATE DIS- SOLVED (MG/L AS SO4)
OCT											
20...	66	21	56	1.5	32	4.9	220	0	180	4.4	68
NOV											
15...	70	22	48	1.3	28	4.7	220	0	180	2.2	66
DEC											
15...	69	18	110	3.1	49	4.2	190	0	160	3.8	62
JAN											
18...	84	24	100	2.5	41	4.8	260	0	210	4.2	76
FEB											
15...	79	23	100	2.5	42	4.3	250	0	210	3.2	75
MAR											
15...	51	13	82	2.7	49	4.2	150	0	123	4.8	51
APR											
18...	72	22	50	1.3	28	3.2	230	0	190	3.7	67
MAY											
18...	79	22	46	1.2	26	3.0	240	0	200	3.1	69
JUN											
13...	62	18	47	1.4	30	4.5	200	0	150	3.2	47
JUL											
14...	72	20	75	2.0	38	6.7	200	0	164	3.2	88
AUG											
22...	62	17	65	1.9	38	6.1	180	0	148	1.8	76
SEP											
19...	45	13	33	1.1	30	4.2	150	0	123	3.8	40

STREAMS TRIBUTARY TO LAKE ST. CLAIR  
04165500 CLINTON RIVER AT MOUNT CLEMENS, MI--CONTINUED

345

WATER-QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978--CONTINUED

DATE	CHLORIDE, DIS- SOLVED (MG/L AS CL)	FLUORIDE, DIS- SOLVED (MG/L AS F)	SILICA, DIS- SOLVED (MG/L AS SiO2)	SOLIDS, RESIDUE AT 180 DEG. C DIS- SOLVED (MG/L)	SOLIDS, SUM OF CONSTI- TUENTS, DIS- SOLVED (MG/L)	SOLIDS, DIS- SOLVED (TONS PER DAY)	NITRO- GEN, NO2+NO3 TOTAL (MG/L AS N)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N)	NITRO- GEN, ORGANIC TOTAL (MG/L AS N)	NITRO- GEN,AM- MONIA + ORGANIC TOTAL (MG/L AS N)
OCT 20...	89	.4	5.5	456	419	308	3.5	.19	--	--
NOV 15...	79	.4	6.5	446	405	456	3.3	.24	--	--
DEC 15...	190	.2	5.7	580	553	1970	2.4	.26	--	--
JAN 18...	160	.4	8.1	607	586	508	3.5	.62	.78	1.4
FEB 15...	170	.4	6.8	636	582	635	2.9	.73	1.2	1.9
MAR 15...	130	.2	5.5	442	411	2510	2.0	.54	1.6	2.1
APR 18...	98	.2	2.6	476	429	788	2.2	.20	.68	.88
MAY 18...	86	.3	4.0	488	428	1000	1.8	.10	1.0	1.1
JUN 13...	87	.3	5.3	445	460	483	1.9	.19	1.2	1.4
JUL 14...	130	.6	4.5	531	496	118	4.1	.17	.93	1.1
AUG 22...	100	.5	4.7	476	420	145	5.9	.44	.56	1.0
SEP 19...	56	.2	5.6	287	271	619	1.8	.06	1.6	1.7

DATE	NITRO- GEN, NH4 + ORG. SUSP. TOTAL (MG/L AS N)	NITRO- GEN, AM- MONIA + ORGANIC DIS. (MG/L AS N)	NITRO- GEN, TOTAL (MG/L AS N)	NITRO- GEN, TOTAL (MG/L AS NO3)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, DIS- SOLVED (MG/L AS P)	CARBON, ORGANIC TOTAL (MG/L AS C)	SEDI- MENT, CHARGE, SUS- PENDED (MG/L)	SEDI- MENT, CHARGE, SUS- PENDED (T/DAY)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM
OCT 20...	--	1.1	--	--	.43	.35	--	19	13	100
NOV 15...	--	.99	--	--	.22	.13	9.2	12	12	100
DEC 15...	--	.79	--	--	.25	.10	10	71	242	100
JAN 18...	.10	1.3	4.9	22	.19	.14	--	6	5.0	100
FEB 15...	.30	1.6	4.8	21	.19	.14	9.4	7	7.0	100
MAR 15...	.80	1.3	4.1	18	.28	.11	11	146	828	100
APR 18...	.10	.78	3.1	14	.10	.06	--	16	26	100
MAY 18...	.17	.93	2.9	13	.16	.06	3.4	50	103	100
JUN 13...	.51	.89	3.3	15	.24	.08	5.7	64	69	100
JUL 14...	.10	1.0	5.2	23	.28	.18	--	16	3.5	100
AUG 22...	.00	1.1	6.9	31	.27	.18	5.7	10	3.1	100
SEP 19...	1.2	.48	3.5	16	.56	.08	9.8	511	1100	100



STREAMS TRIBUTARY TO LAKE ST. CLAIR  
04165500 CLINTON RIVER AT MOUNT CLEMENS, MI--CONTINUED

WATER-QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978--CONTINUED

DATE	TIME	ARSENIC TOTAL (UG/L AS AS)	ARSENIC DIS- SOLVED (UG/L AS AS)	BARIUM, TOTAL RECOV- ERABLE (UG/L AS BA)	BARIUM, DIS- SOLVED (UG/L AS BA)	CADMIUM TOTAL RECOV- ERABLE (UG/L AS CD)	CADMIUM DIS- SOLVED (UG/L AS CD)	CHRO- MIUM, TOTAL RECOV- ERABLE (UG/L AS CR)	CHRO- MIUM, DIS- SOLVED (UG/L AS CR)	COBALT, TOTAL RECOV- ERABLE (UG/L AS CO)
OCT 20...	1200	1	1	0	0	2	0	20	3	6
JAN 18...	1045	0	0	0	0	0	1	10	1	0
APR 18...	1130	2	2	0	0	1	0	40	1	0
JUL 14...	1045	3	2	100	100	--	5	10	0	2

DATE	COBALT, DIS- SOLVED (UG/L AS CO)	COPPER, TOTAL RECOV- ERABLE (UG/L AS CU)	COPPER, DIS- SOLVED (UG/L AS CU)	IRON, TOTAL RECOV- ERABLE (UG/L AS FE)	IRON, DIS- SOLVED (UG/L AS FE)	LEAD, TOTAL RECOV- ERABLE (UG/L AS PB)	LEAD, DIS- SOLVED (UG/L AS PB)	MANGA- NESE, TOTAL RECOV- ERABLE (UG/L AS MN)	MANGA- NESE, DIS- SOLVED (UG/L AS MN)	MERCURY TOTAL RECOV- ERABLE (UG/L AS HG)
OCT 20...	0	10	2	780	120	29	11	50	30	<.5
JAN 18...	0	8	4	490	10	7	0	50	--	<.5
APR 18...	1	8	2	1000	50	18	7	70	50	<.5
JUL 14...	0	8	2	850	20	23	--	80	50	.5

DATE	MERCURY DIS- SOLVED (UG/L AS HG)	SELE- NIUM, TOTAL (UG/L AS SE)	SELE- NIUM, DIS- SOLVED (UG/L AS SE)	SILVER, TOTAL RECOV- ERABLE (UG/L AS AG)	SILVER, DIS- SOLVED (UG/L AS AG)	ZINC, TOTAL RECOV- ERABLE (UG/L AS ZN)	ZINC, DIS- SOLVED (UG/L AS ZN)	CARBON, ORGANIC DIS- SOLVED (MG/L AS C)	CARBON, ORGANIC SUS- PENDED TOTAL (MG/L AS C)
OCT 20...	<.5	0	0	0	0	20	20	9.9	.9
JAN 18...	<.5	0	0	0	0	40	30	9.2	--
APR 18...	<.5	0	0	0	0	30	20	4.3	--
JUL 14...	.5	0	0	0	0	60	20	8.8	1.9

QUALITATIVE AND ASSOCIATED QUANTITATIVE ANALYSES OF BIOLOGICAL DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
PERIPHYTON

DATE	TIME	LENGTH OF EXPO- SURE (DAYS)	PERI- PHYTON BIOMASS ASH WEIGHT G/SQ M	PERI- PHYTON BIOMASS TOTAL DRY WEIGHT G/SQ M	CHLOR-A PERI- PHYTON CHROMO- GRAPHIC FLUOROM (MG/M2)	CHLOR-B PERI- PHYTON CHROMO- GRAPHIC FLUOROM (MG/M2)
NOV 15...	1530	26	36.0	40.9	5.71	1.55
MAR 15...	1230	28	2.28	3.46	1.68	.160
MAY 18...	1145	30	13.7	15.3	6.22	.900

## 04165500 CLINTON RIVER AT MOUNT CLEMENS, MI--CONTINUED

## WATER-QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978--CONTINUED

DATE	TIME	PCB, TOTAL (UG/L)	AROCLOR TOT. IN BOT MAT 1254 PCB SERIES (UG/KG)	ALDRIN, TOTAL (UG/L)	ALDRIN, TOTAL IN BOT- TOM MA- TERIAL (UG/KG)	ATRA- ZINE, TOTAL (UG/L)	ATRA- ZINE, TOTAL IN BOT- TOM MA- TERIAL (UG/KG)	CHLOR- DANE, TOTAL (UG/L)	CHLOR- DANE, TOTAL IN BOT- TOM MA- TERIAL (UG/KG)	DDD, TOTAL (UG/L)	DDD, TOTAL IN BOT- TOM MA- TERIAL (UG/KG)
NOV 15...	1530	ND	17	ND	ND	ND	ND	ND	ND	ND	ND
FEB 15...	1145	ND	--	ND	--	ND	--	ND	--	ND	--
MAY 18...	1145	ND	--	ND	ND	.28	--	ND	ND	ND	--
AUG 22...	1215	ND	--	ND	--	--	--	ND	--	ND	--

DATE	DDE, TOTAL (UG/L)	DDE, TOTAL IN BOT- TOM MA- TERIAL (UG/KG)	DDT, TOTAL (UG/L)	DDT, TOTAL IN BOT- TOM MA- TERIAL (UG/KG)	DI- AZINON, TOTAL (UG/L)	DI- AZINON, TOTAL IN BOT- TOM MA- TERIAL (UG/KG)	DI- ELDRIN, TOTAL (UG/L)	DI- ELDRIN, TOTAL IN BOT- TOM MA- TERIAL (UG/KG)	ENDRIN, TOTAL (UG/L)	ENDRIN, TOTAL IN BOT- TOM MA- TERIAL (UG/KG)
NOV 15...	ND	ND	ND	ND	ND	ND	ND	.2	ND	ND
FEB 15...	ND	--	ND	--	ND	--	ND	--	ND	--
MAY 18...	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
AUG 22...	ND	--	ND	--	ND	--	ND	--	ND	--

DATE	ETHION, TOTAL (UG/L)	ETHION, TOTAL IN BOT- TOM MA- TERIAL (UG/KG)	HEPTA- CHLOR, TOTAL (UG/L)	HEPTA- CHLOR, TOTAL IN BOT- TOM MA- TERIAL (UG/KG)	HEPTA- CHLOR EPOXIDE TOTAL (UG/L)	HEPTA- CHLOR EPOXIDE TOT. IN BOTTOM MATL. (UG/KG)	LINDANE TOTAL (UG/L)	LINDANE TOTAL IN BOT- TOM MA- TERIAL (UG/KG)	MALA- THION, TOTAL (UG/L)	MALA- THION, TOTAL IN BOT- TOM MA- TERIAL (UG/KG)
NOV 15...	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
FEB 15...	ND	--	ND	--	ND	--	ND	--	ND	--
MAY 18...	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
AUG 22...	ND	--	ND	--	ND	--	ND	--	ND	--

DATE	METH- OXY- CHLOR, TOTAL (UG/L)	METH- OXY- CHLOR, TOT. IN BOTTOM MATL. (UG/KG)	METHYL PARA- THION, TOTAL (UG/L)	METHYL PARA- THION, TOT. IN BOTTOM MATL. (UG/KG)	METHYL TRI- THION, TOTAL (UG/L)	METHYL TRI- THION, TOT. IN BOTTOM MATL. (UG/KG)	PARA- THION, TOTAL (UG/L)	PARA- THION, TOTAL IN BOT- TOM MA- TERIAL (UG/KG)	SIMA- ZINE TOTAL COUL- SON COND. (UG/L)	SIMA- ZINE IN BOTTOM MATERI- AL (UG/ KG DRY SOLIDS)
NOV 15...	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
FEB 15...	ND	--	ND	--	ND	--	ND	--	ND	--
MAY 18...	ND	ND	ND	ND	ND	ND	ND	ND	ND	--
AUG 22...	ND	--	ND	--	ND	--	ND	--	--	--

DATE	TOX- APHENE, TOTAL (UG/L)	TOXA- PHENE, TOTAL IN BOT- TOM MA- TERIAL (UG/KG)	TOTAL TRI- THION (UG/L)	TRI- THION, TOTAL IN BOT- TOM MA- TERIAL (UG/KG)	2,4-D, TOTAL (UG/L)	2,4-D, TOTAL IN BOT- TOM MA- TERIAL (UG/KG)	2,4,5-T TOTAL (UG/L)	2,4,5-T TOTAL IN BOT- TOM MA- TERIAL (UG/KG)	SILVEX, TOTAL (UG/L)	SILVEX, TOTAL IN BOT- TOM MA- TERIAL (UG/KG)
NOV 15...	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
FEB 15...	ND	--	ND	--	ND	--	ND	--	ND	--
MAY 18...	ND	ND	ND	ND	--	--	--	--	--	--
AUG 22...	ND	--	ND	--	--	--	--	--	--	--

ND--NOT DETECTED

STREAMS TRIBUTARY TO LAKE ST. CLAIR  
04165500 CLINTON RIVER AT MOUNT CLEMENS, MI--CONTINUED

SPECIFIC CONDUCTANCE (MICROMHOS/CM AT 25 DEG. C), WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
OCTOBER			NOVEMBER			DECEMBER			JANUARY			
1	741	383	608	777	755	766	1390	652	823	---	---	---
2	677	503	602	802	766	780	706	674	687	---	---	---
3	738	678	721	803	783	793	693	657	672	---	---	---
4	760	730	744	792	763	781	711	666	686	---	---	---
5	799	757	778	790	784	785	719	692	705	---	---	---
6	847	799	819	790	772	782	755	701	722	---	---	---
7	853	824	837	788	612	699	877	759	827	---	---	---
8	835	571	721	699	626	675	897	877	888	---	---	---
9	670	591	633	733	702	717	---	---	---	---	---	---
10	730	673	710	765	598	664	---	---	---	---	---	---
11	748	730	738	699	579	642	---	---	---	---	---	---
12	768	742	751	737	701	724	---	---	---	---	---	---
13	754	734	746	771	740	757	---	---	---	---	---	---
14	754	744	750	774	769	771	---	---	---	---	---	---
15	787	751	760	800	751	762	---	---	---	---	---	---
16	818	787	800	805	696	755	---	---	---	---	---	---
17	795	768	778	810	732	744	---	---	---	---	---	---
18	789	772	779	749	732	742	---	---	---	1100	1090	1100
19	785	758	771	753	739	748	---	---	---	1080	1070	1070
20	796	756	770	764	556	728	---	---	---	1110	1070	1090
21	797	783	791	688	576	642	---	---	---	1110	1040	1060
22	794	772	786	740	692	728	---	---	---	1120	1050	1080
23	798	772	782	744	687	721	---	---	---	1180	1120	1170
24	776	760	770	761	728	740	---	---	---	1190	1140	1160
25	782	773	777	793	747	770	---	---	---	1170	1130	1140
26	777	765	770	857	761	802	---	---	---	3580	1170	2010
27	797	774	786	924	828	863	---	---	---	1910	1500	1740
28	791	775	780	845	819	833	---	---	---	1500	1240	1380
29	789	781	785	905	819	858	---	---	---	1290	1180	1240
30	790	765	783	1040	839	915	---	---	---	1190	1110	1140
31	779	765	772	---	---	---	---	---	---	1170	1110	1130
MONTH	853	383	755	1040	556	756						

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
FEBRUARY			MARCH			APRIL			MAY			
1	1100	1060	1080	1230	1160	1180	728	660	698	739	734	736
2	1060	1040	1050	1200	1140	1170	718	664	686	751	746	749
3	1080	1040	1050	1200	1140	1150	666	632	643	784	772	780
4	1110	1040	1070	1340	1140	1240	669	635	646	793	791	762
5	1050	1040	1050	1340	1180	1260	723	668	693	802	740	766
6	1030	992	1010	1160	1110	1130	731	699	719	749	725	733
7	1030	1010	1020	1200	1140	1170	763	687	724	759	727	742
8	1030	975	994	1250	1160	1190	795	756	772	778	745	767
9	1090	1000	1030	1230	1160	1190	763	703	732	753	721	743
10	1170	790	1100	1350	1190	1280	763	685	719	732	720	725
11	1170	1140	1160	1610	1310	1420	829	779	813	750	728	739
12	1200	1140	1170	1650	1330	1450	844	777	812	777	760	767
13	1200	1130	1170	1540	1240	1310	841	796	822	790	704	762
14	1180	1100	1140	1300	719	1060	815	764	792	709	662	675
15	1150	1060	1100	777	703	735	810	783	797	675	672	673
16	1120	1080	1100	726	644	676	805	771	789	703	684	693
17	1110	1070	1090	654	625	638	849	772	809	740	714	725
18	1120	1050	1080	637	595	618	831	669	758	816	750	779
19	1070	1050	1060	626	532	579	848	742	778	831	814	824
20	1120	1040	1070	552	470	498	807	604	658	828	817	824
21	1090	1020	1060	481	360	416	625	601	613	828	787	807
22	1070	1010	1040	365	344	351	631	512	529	798	789	792
23	1120	1030	1070	380	360	371	546	537	542	812	791	797
24	1140	1090	1110	396	379	386	578	555	570	836	810	821
25	1230	1080	1140	444	400	423	594	574	581	834	824	829
26	1880	1250	1590	524	453	490	606	597	602	836	821	827
27	1750	1390	1550	538	526	531	630	617	625	831	824	826
28	1460	1230	1320	562	536	546	670	641	657	831	819	824
29	---	---	---	565	553	559	705	682	696	831	821	824
30	---	---	---	594	545	564	725	715	722	844	821	829
31	---	---	---	653	599	623	---	---	---	848	676	773
MONTH	1880	790	1120	1650	344	845	849	512	700	848	662	771

## 04165500 CLINTON RIVER AT MOUNT CLEMENS, MI--CONTINUED

## SPECIFIC CONDUCTANCE (MICROMHOS/CM AT 25 DEG. C), WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
	JUNE			JULY			AUGUST			SEPTEMBER		
1	717	693	710	752	742	748	922	872	892	872	857	864
2	739	712	732	766	760	764	923	906	917	873	870	871
3	732	727	729	776	772	774	926	813	870	890	868	878
4	727	724	726	790	784	787	865	814	829	898	889	894
5	732	724	728	804	797	800	849	844	847	907	890	899
6	739	727	736	816	809	813	858	850	856	898	851	867
7	752	735	745	826	822	825	876	858	867	864	855	858
8	763	750	759	836	830	833	786	624	646	859	823	843
9	760	757	759	848	844	846	646	635	641	839	791	823
10	763	755	761	858	854	856	661	641	648	819	734	794
11	772	758	763	873	866	870	672	656	666	766	737	757
12	767	758	765	898	881	889	675	670	674	783	764	774
13	783	705	726	916	906	912	679	674	677	775	598	732
14	716	711	714	941	899	923	681	676	679	595	561	572
15	727	722	724	954	896	920	691	679	687	556	458	479
16	750	735	742	949	944	946	698	692	695	477	468	473
17	765	758	760	963	944	954	700	692	695	482	475	478
18	773	766	771	973	950	963	716	702	711	502	465	480
19	777	773	775	947	942	944	720	716	718	494	473	487
20	790	626	773	970	942	957	789	719	744	512	486	501
21	634	616	623	977	964	972	794	784	789	524	518	522
22	634	630	633	973	872	929	808	792	800	533	530	532
23	650	642	647	877	867	871	821	806	814	548	540	544
24	671	657	666	883	870	875	824	811	819	562	554	558
25	689	677	681	917	884	899	844	820	832	575	568	571
26	694	687	690	937	908	918	850	842	848	593	581	587
27	702	699	700	946	915	934	856	851	854	605	599	601
28	715	707	712	915	881	907	856	854	855	621	611	617
29	729	722	726	905	881	896	863	852	856	633	626	630
30	737	734	735	897	861	864	870	861	866	644	639	641
31	---	---	---	874	861	868	868	859	865	---	---	---
MONTH	790	616	724	977	742	879	926	624	779	907	458	671

## TEMPERATURE (DEG. C) OF WATER, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
	OCTOBER			NOVEMBER			DECEMBER			JANUARY		
1	16.0	14.0	15.0	12.5	11.0	12.0	5.0	4.0	4.5	---	---	---
2	14.0	13.5	14.0	13.5	12.5	13.0	4.0	2.5	3.0	---	---	---
3	14.0	12.5	13.0	14.5	13.0	13.5	2.5	2.0	2.0	---	---	---
4	14.5	12.5	13.5	14.5	13.5	14.5	2.0	1.5	1.5	---	---	---
5	14.5	13.5	14.0	13.5	13.0	13.0	1.5	.0	1.0	---	---	---
6	14.0	12.5	13.0	14.0	12.5	13.0	1.0	.5	1.0	---	---	---
7	13.5	12.5	13.0	14.5	13.5	14.0	1.5	.5	1.0	---	---	---
8	14.5	12.5	13.5	14.0	14.0	14.0	1.0	1.0	1.0	---	---	---
9	14.0	12.5	13.0	14.5	13.5	14.0	---	---	---	---	---	---
10	12.5	11.0	12.0	15.0	12.0	14.0	---	---	---	---	---	---
11	12.5	11.5	12.5	12.0	8.0	9.5	---	---	---	---	---	---
12	11.5	11.0	11.0	8.0	5.5	6.5	---	---	---	---	---	---
13	11.0	10.5	11.0	5.5	4.5	5.0	---	---	---	---	---	---
14	11.5	10.5	11.0	4.5	4.5	4.5	---	---	---	---	---	---
15	11.0	11.0	11.0	7.0	4.5	5.0	---	---	---	---	---	---
16	11.0	10.0	10.5	9.0	7.5	8.0	---	---	---	---	---	---
17	9.5	8.5	9.0	9.0	8.0	8.5	---	---	---	---	---	---
18	11.0	9.5	10.0	8.0	6.0	7.0	---	---	---	.0	.0	.0
19	11.5	11.0	11.0	6.0	5.5	5.5	---	---	---	.5	.0	.5
20	12.0	11.0	11.5	8.5	5.5	6.5	---	---	---	.0	.0	.0
21	12.5	11.0	11.5	8.0	6.0	7.5	---	---	---	.0	.0	.0
22	13.0	12.5	13.0	6.0	5.0	5.5	---	---	---	.5	.0	.0
23	13.0	11.5	12.0	5.0	4.5	5.0	---	---	---	.5	.0	.0
24	12.0	11.0	11.5	5.5	5.0	5.0	---	---	---	.5	.0	.5
25	13.0	12.0	13.0	5.0	4.5	4.5	---	---	---	1.0	.5	1.0
26	14.5	13.0	13.5	5.0	1.0	2.5	---	---	---	1.5	.5	1.0
27	14.5	13.5	14.0	1.0	.0	.5	---	---	---	1.0	.5	1.0
28	14.0	13.0	13.5	1.5	.0	1.0	---	---	---	1.0	.0	.5
29	13.0	11.5	12.5	2.5	1.5	2.0	---	---	---	1.0	.0	.5
30	12.0	11.0	11.0	3.0	2.0	2.0	---	---	---	1.0	.0	.5
31	11.5	11.0	11.0	---	---	---	---	---	---	.5	.0	.5
MONTH	16.0	8.5	12.0	15.0	.0	8.0						

STREAMS TRIBUTARY TO LAKE ST. CLAIR  
04165500 CLINTON RIVER AT MOUNT CLEMENS, MI--CONTINUED

TEMPERATURE (DEG. C) OF WATER, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
FEBRUARY			MARCH			APRIL			MAY			
1	1.0	.0	.5	2.5	1.5	2.0	4.0	3.0	4.0	13.0	10.5	12.0
2	1.0	.0	.5	2.0	1.0	1.5	3.0	1.0	2.0	13.5	10.5	11.5
3	.5	.0	.0	2.0	1.0	1.5	2.5	1.0	1.5	14.5	11.0	12.5
4	.0	.0	.0	2.0	1.0	1.5	5.0	2.5	3.5	12.0	10.5	11.5
5	.5	.0	.0	1.5	.5	1.5	5.5	5.0	5.0	10.5	9.5	10.0
6	.0	.0	.0	2.0	.5	1.5	6.0	4.5	5.0	10.5	9.0	10.0
7	.0	.0	.0	2.0	1.0	1.5	6.0	5.5	6.0	13.0	9.5	12.0
8	.0	.0	.0	2.0	1.0	1.5	6.0	5.5	6.0	13.5	12.5	13.0
9	.5	.0	.0	2.5	1.0	2.0	6.5	6.0	6.0	13.0	12.5	13.0
10	1.0	.0	.5	4.5	2.0	3.0	7.5	6.5	7.0	13.0	12.0	12.5
11	1.0	.0	.5	4.5	3.5	4.0	9.5	6.5	7.5	14.5	12.5	13.5
12	1.0	.5	.5	5.0	3.5	4.0	7.5	6.5	7.0	14.5	13.5	14.0
13	1.0	.5	1.0	4.0	2.0	2.5	7.5	7.5	7.5	14.5	13.5	14.0
14	1.0	.0	.5	3.0	1.5	2.0	8.0	7.5	8.0	14.0	13.5	14.0
15	1.5	.0	1.0	1.5	.5	1.0	8.5	8.5	8.5	13.5	13.0	13.0
16	1.5	.5	1.0	1.0	.5	.5	9.0	8.5	8.5	14.5	12.5	13.5
17	1.0	.0	.5	.5	.0	.0	9.0	8.5	9.0	16.5	13.5	15.0
18	1.0	.0	.5	.0	.0	.0	9.5	8.5	9.0	19.5	15.5	17.5
19	1.0	.0	.5	.5	.0	.0	9.5	8.5	9.0	21.5	18.0	19.5
20	1.0	.0	.5	.5	.0	.0	10.0	8.5	9.0	21.0	20.0	20.5
21	1.5	.0	.5	.5	.0	.0	8.5	7.0	8.0	19.5	17.5	18.5
22	1.5	.0	.5	.0	.0	.0	10.0	7.0	8.5	18.5	16.0	17.5
23	1.5	.0	.5	2.0	.0	1.0	9.5	8.5	9.5	18.5	17.0	18.0
24	1.5	.5	1.0	2.0	.0	1.0	9.5	9.0	9.5	20.5	18.0	18.5
25	1.5	1.0	1.5	1.0	.0	.5	11.5	8.5	10.0	22.0	19.0	20.0
26	2.0	1.0	1.5	2.0	.0	.5	13.0	10.0	11.5	23.0	20.5	21.5
27	1.5	1.0	1.5	2.0	1.0	1.5	14.5	11.0	12.5	24.0	21.5	22.5
28	2.0	1.5	1.5	2.0	1.5	1.5	14.5	12.0	13.5	24.0	22.0	23.0
29	---	---	---	2.5	2.0	2.0	14.5	13.0	13.5	24.0	22.5	23.0
30	---	---	---	2.5	1.5	2.0	14.0	11.0	12.5	24.5	23.0	24.0
31	---	---	---	4.0	2.5	3.0	---	---	---	24.5	22.0	23.0
MONTH	2.0	.0	.5	5.0	.0	1.5	14.5	1.0	8.0	24.5	9.0	16.0

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
JUNE			JULY			AUGUST			SEPTEMBER			
1	24.0	22.0	23.0	22.5	19.0	21.0	23.0	21.0	22.0	22.0	19.5	20.5
2	24.0	21.5	23.0	19.0	18.5	19.0	23.0	22.5	22.5	22.0	20.5	21.5
3	22.0	19.0	20.5	18.5	18.0	18.0	23.5	22.0	22.5	23.0	22.0	22.5
4	21.0	18.5	20.0	19.0	18.0	18.5	23.0	20.5	22.0	22.5	20.5	21.5
5	21.0	19.0	20.0	21.5	18.5	20.0	22.5	21.5	22.0	23.0	21.5	22.0
6	21.0	19.0	20.0	23.5	20.0	22.0	22.5	22.0	22.0	24.0	22.5	23.0
7	21.5	19.0	20.5	25.0	22.0	23.5	22.5	21.5	22.0	24.0	22.5	23.0
8	20.0	19.0	19.5	24.5	23.0	24.0	23.5	21.0	22.0	24.5	23.0	23.5
9	19.0	16.5	17.5	24.0	22.5	23.5	24.0	22.5	23.5	24.5	23.5	24.0
10	19.5	17.5	18.5	23.5	22.0	23.0	24.0	21.5	22.5	23.5	21.5	22.5
11	22.5	18.5	20.5	22.0	20.0	21.0	23.5	22.5	23.0	24.0	22.5	23.0
12	22.5	20.5	22.0	21.5	19.0	20.5	24.0	22.5	23.0	24.0	21.0	22.5
13	20.5	17.5	18.5	21.5	21.0	21.5	25.0	23.0	24.0	21.0	18.0	19.0
14	19.0	16.5	17.5	23.5	21.0	22.0	25.5	24.0	24.5	20.0	17.5	18.0
15	19.0	17.5	18.0	24.5	22.5	23.5	25.0	24.5	25.0	21.0	19.5	20.5
16	19.0	18.5	18.5	24.5	22.0	23.0	26.0	25.0	25.5	21.5	19.0	20.5
17	22.0	18.5	19.5	23.0	20.5	22.0	25.5	23.0	24.5	21.0	19.0	20.0
18	22.5	21.5	22.0	23.0	22.0	22.5	25.0	24.5	25.0	20.5	19.0	19.5
19	23.5	21.5	22.5	23.5	22.5	23.0	25.0	24.5	25.0	27.5	20.0	23.5
20	23.5	21.0	22.0	25.5	22.5	23.5	24.0	22.0	23.0	29.5	27.0	28.0
21	22.5	20.0	21.5	26.0	25.0	25.5	23.5	22.0	23.0	29.0	27.0	28.0
22	22.0	20.0	21.0	26.5	24.0	25.5	23.0	21.5	22.5	26.5	24.0	25.0
23	22.0	19.5	21.0	26.5	24.5	25.5	24.0	22.0	23.0	24.0	22.5	23.5
24	22.5	19.5	21.5	24.5	22.5	23.5	23.5	23.0	23.5	24.0	22.0	23.0
25	22.0	21.0	22.0	24.5	22.5	23.5	24.5	23.0	23.5	23.5	22.5	23.0
26	22.0	21.0	21.5	25.5	24.0	25.0	23.5	23.0	23.0	23.0	21.0	22.0
27	24.0	21.5	23.0	25.0	23.0	24.5	23.5	22.5	23.0	22.5	21.5	22.0
28	25.0	22.0	24.0	24.0	22.0	23.0	24.0	23.0	23.0	22.0	20.5	21.0
29	25.5	23.0	24.5	23.5	22.5	23.0	23.5	22.5	23.0	21.0	19.5	20.0
30	25.0	22.5	24.0	22.5	21.0	22.0	22.5	21.5	22.0	20.0	19.5	19.5
31	---	---	---	21.5	20.0	21.0	22.0	20.5	21.0	---	---	---
MONTH	25.5	16.5	21.0	26.5	18.0	22.5	26.0	20.5	23.0	29.5	17.5	22.0



## STREAMS TRIBUTARY TO DETROIT RIVER

351

04165700 DETROIT RIVER AT DETROIT, MI  
(National stream-quality accounting network station)

LOCATION.--Lat 42°20'50", long 82°57'31", in T.2 S., R.13 E., Wayne County, Hydrologic Unit 04090004, at Detroit municipal water treatment facility at Water Works Park at Detroit.

DRAINAGE AREA.--228,800 mi<sup>2</sup> (592,600 km<sup>2</sup>), approximately.

PERIOD OF RECORD.--Water years 1970 to current year.

PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE: February 1974 to current year.

WATER TEMPERATURES: October 1973 to current year.

REMARKS.--During the winter months the sample is collected from a raw-water tap at Detroit municipal treatment facility. The intake is in a lagoon at north end of Belle Isle in the Detroit River. During summer months depth-integrated samples are collected by boat along river cross section at north end of Belle Isle. Daily temperature values are the mean of three measurements. Daily mean water discharges are reported for sampling times.

COOPERATION.--Daily mean temperature and specific conductance records are collected by Detroit municipal treatment facility employees. Water discharges were furnished by the National Oceanic and Atmospheric Administration.

EXTREMES FOR PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE: Maximum daily, 345 micromhos Apr. 19, 1978; minimum daily, 194 micromhos July 24, 1976.

WATER TEMPERATURES: Maximum daily, 24.5°C July 21, 1977; minimum daily, 0.5°C on many days during winter periods.

EXTREMES FOR CURRENT YEAR.--

SPECIFIC CONDUCTANCE: Maximum daily, 345 micromhos Apr. 19; minimum daily, 196 micromhos Apr. 7, July 17.

WATER TEMPERATURES: Maximum daily, 24.0°C Aug. 16; minimum daily, 0.5°C on many days during winter period.

## WATER QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DATE	TIME	STREAM- FLOW, INSTAN- TANEOUS (CFS)	SPE- CIFIC CON- DUCT- ANCE (MICRO- MHOS)	PH (UNITS)	TEMPER- ATURE (DEG C)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED (MG/L)	COLI- FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML)	STREP- TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML)	HARD- NESS, NONCAR- BONATE (MG/L CAC03)	HARD- NESS, NONCAR- BONATE (MG/L CAC03)
OCT											
19...	1530	199000	235	8.1	10.0	10.9	98	K3	<1	110	20
NOV											
16...	1600	197000	216	8.1	6.0	11.6	96	K10	K9	100	18
DEC											
14...	1415	198000	211	7.7	4.0	13.5	105	K3	19	110	28
JAN											
17...	1415	195000	221	8.0	.0	13.2	92	<1	K3	110	23
FEB											
16...	1215	197000	228	7.7	.5	13.8	96	K1	<1	110	28
MAR											
16...	1100	204000	203	7.8	1.0	12.9	90	7	10	97	15
APR											
26...	1500	192000	220	8.3	7.5	12.8	108	<1	<1	110	23
MAY											
16...	1300	197000	219	8.1	11.5	11.0	102	<1	<1	100	23
JUN											
14...	1430	196000	200	8.3	16.5	9.7	99	<1	<1	100	22
JUL											
12...	1215	194000	224	8.4	22.0	8.2	94	<1	100	100	16
AUG											
23...	1215	199000	220	8.3	23.0	8.1	95	K11	26	97	15
SEP											
20...	1430	204000	210	8.4	20.0	8.8	98	K6	26	110	23
DATE		CALCIUM DIS- SOLVED (MG/L AS CA)	MAGNE- SIUM, DIS- SOLVED (MG/L AS MG)	SODIUM, DIS- SOLVED (MG/L AS NA)	SODIUM AD- SORP- TION RATIO	POTAS- SIUM, DIS- SOLVED (MG/L AS K)	BICAR- BONATE (MG/L AS HCO3)	CAR- BONATE (MG/L AS CO3)	ALKA- LITY (MG/L AS CAC03)	CARBON DIOXIDE DIS- SOLVED (MG/L AS CO2)	SULFATE DIS- SOLVED (MG/L AS SO4)
OCT											
19...	31	7.5	5.4	.2	10	1.4	110	0	90	1.4	20
NOV											
16...	29	7.4	4.7	.2	9	1.1	100	0	82	1.3	17
DEC											
14...	30	7.6	4.1	.2	8	1.1	100	0	82	3.2	19
JAN											
17...	29	7.8	4.8	.2	9	1.1	100	0	82	1.6	16
FEB											
16...	30	7.7	5.3	.2	10	1.0	100	0	82	3.2	18
MAR											
16...	27	7.2	4.2	.2	9	1.0	100	0	82	2.5	16
APR											
26...	30	7.4	5.0	.2	9	1.1	100	0	82	.8	19
MAY											
16...	30	7.2	5.3	.2	10	1.1	100	0	82	1.3	18
JUN											
14...	28	7.2	4.3	.2	9	1.0	100	0	78	.8	16
JUL											
12...	28	7.3	4.5	.2	9	1.0	100	1	84	.6	16
AUG											
23...	27	7.3	4.6	.2	9	1.0	100	0	82	.8	17
SEP											
20...	28	8.6	4.2	.2	8	.9	100	0	82	.6	16

K--BASED ON COLONY COUNT OUTSIDE THE ACCEPTABLE RANGE (NON IDEAL COLONY COUNT)

STREAMS TRIBUTARY TO DETROIT RIVER  
04165700 DETROIT RIVER AT DETROIT, MI--CONTINUED

WATER-QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978--CONTINUED

DATE	CHLO- RIDE, DIS- SOLVED (MG/L AS CL)	FLUO- RIDE, DIS- SOLVED (MG/L AS F)	SILICA, DIS- SOLVED (MG/L AS SI02)	SOLIDS, RESIDUE AT 180 DEG. C DIS- SOLVED (MG/L)	SOLIDS, SUM OF CONSTI- TUENTS, DIS- SOLVED (MG/L)	SOLIDS, DIS- SOLVED (TONS PER DAY)	NITRO- GEN, NO2+NO3 TOTAL (MG/L AS N)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N)	NITRO- GEN, ORGANIC TOTAL (MG/L AS N)	NITRO- GEN,AM- MONIA + ORGANIC TOTAL (MG/L AS N)
OCT 19...	8.5	.1	1.5	117	130	62900	.44	.01	--	--
NOV 16...	6.3	.1	1.2	115	116	61200	.26	.01	--	--
DEC 14...	6.9	.1	1.3	125	119	66800	.31	.01	--	--
JAN 17...	7.2	.1	1.5	128	117	67400	.30	.01	.15	.16
FEB 16...	8.7	.1	1.2	129	121	68600	.31	.02	.21	.23
MAR 16...	5.9	.1	1.4	122	112	67200	.30	.00	.20	.20
APR 26...	7.7	.1	.9	118	121	61200	.32	.02	.59	.61
MAY 16...	9.4	.1	.6	136	121	72300	.27	.01	.26	.27
JUN 14...	7.7	.1	.6	136	161	72000	.30	.02	.26	.28
JUL 12...	6.3	.1	1.0	128	115	67000	.24	.00	.19	.19
AUG 23...	8.4	.1	1.3	127	116	68200	.23	.14	.74	.88
SEP 20...	7.0	.1	1.1	117	115	64400	.22	.01	.32	.33

DATE	NITRO- GEN, NH4 + ORG. SUSP. TOTAL (MG/L AS N)	NITRO- GEN, AM- MONIA + ORGANIC DIS. (MG/L AS N)	NITRO- GEN, TOTAL (MG/L AS N)	NITRO- GEN, TOTAL (MG/L AS NO3)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, DIS- SOLVED (MG/L AS P)	CARRON, ORGANIC TOTAL (MG/L AS C)	SEDI- MENT, SUS- PENDED (MG/L)	SEDI- MENT DIS- CHARGE, SUS- PENDED (T/DAY)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM
OCT 19...	--	.19	--	--	.02	.01	--	20	10700	100
NOV 16...	--	.19	--	--	.02	.00	15	10	5320	100
DEC 14...	--	.16	--	--	.01	.00	--	--	--	--
JAN 17...	.02	.14	.46	2.0	.01	.00	--	--	--	--
FEB 16...	.08	.15	.54	2.4	.01	.00	1.4	--	--	--
MAR 16...	.17	.03	.50	2.2	.02	.00	1.2	--	--	--
APR 26...	.45	.16	.93	4.1	.02	.00	--	16	8290	100
MAY 16...	.09	.18	.54	2.4	.01	.00	5.3	6	3190	100
JUN 14...	.08	.20	.58	2.6	.01	.00	3.6	7	3700	100
JUL 12...	.02	.17	.43	1.9	.03	.00	--	9	4710	100
AUG 23...	.55	.33	1.1	4.9	.01	.00	2.9	--	--	--
SEP 20...	.33	.00	.55	2.4	.01	.00	3.6	8	4410	100

STREAMS TRIBUTARY TO DETROIT RIVER  
04165700 DETROIT RIVER AT DETROIT, MI--CONTINUED

353

WATER-QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978--CONTINUED

DATE	TIME	ARSENIC TOTAL (UG/L AS AS)	ARSENIC DIS- SOLVED (UG/L AS AS)	BARIUM, TOTAL RECOV- ERABLE (UG/L AS BA)	BARIUM, DIS- SOLVED (UG/L AS BA)	CADMIUM TOTAL RECOV- ERABLE (UG/L AS CD)	CADMIUM DIS- SOLVED (UG/L AS CD)	CHRO- MIUM, TOTAL RECOV- ERABLE (UG/L AS CR)	CHRO- MIUM, DIS- SOLVED (UG/L AS CR)	COBALT, TOTAL RECOV- ERABLE (UG/L AS CO)
OCT 19...	1530	2	2	0	0	0	0	60	2	3
JAN 17...	1415	0	0	0	0	2	1	<10	2	0
APR 26...	1500	1	1	0	0	3	1	30	0	0
JUL 12...	1215	1	1	0	0	--	1	10	1	0

DATE	COBALT, DIS- SOLVED (UG/L AS CO)	COPPER, TOTAL RECOV- ERABLE (UG/L AS CU)	COPPER, DIS- SOLVED (UG/L AS CU)	IRON, TOTAL RECOV- ERABLE (UG/L AS FE)	IRON, DIS- SOLVED (UG/L AS FE)	LEAD, TOTAL RECOV- ERABLE (UG/L AS PB)	LEAD, DIS- SOLVED (UG/L AS PB)	MANGA- NESE, TOTAL RECOV- ERABLE (UG/L AS MN)	MANGA- NESE, DIS- SOLVED (UG/L AS MN)	MERCURY TOTAL RECOV- ERABLE (UG/L AS HG)
OCT 19...	0	24	0	960	30	39	7	20	0	<.5
JAN 17...	0	5	2	100	0	4	1	0	0	<.5
APR 26...	0	19	5	380	50	26	11	10	0	<.5
JUL 12...	0	6	2	290	10	20	2	10	10	.5

DATE	MERCURY DIS- SOLVED (UG/L AS HG)	SELE- NIUM, TOTAL (UG/L AS SE)	SELE- NIUM, DIS- SOLVED (UG/L AS SE)	SILVER, TOTAL RECOV- ERABLE (UG/L AS AG)	SILVER, DIS- SOLVED (UG/L AS AG)	ZINC, TOTAL RECOV- ERABLE (UG/L AS ZN)	ZINC, DIS- SOLVED (UG/L AS ZN)	CARBON, ORGANIC DIS- SOLVED (MG/L AS C)	CARBON, ORGANIC SUS- PENDED TOTAL (MG/L AS C)
OCT 19...	<.5	0	0	0	0	20	0	6.0	.9
JAN 17...	<.5	0	0	0	0	10	10	3.4	.3
APR 26...	<.5	0	0	0	0	10	10	3.4	.5
JUL 12...	.5	0	0	0	0	10	0	4.1	1.0

QUALITATIVE AND ASSOCIATED QUANTITATIVE ANALYSES OF BIOLOGICAL DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
PERIPHYTON

DATE	TIME	LENGTH OF EXPO- SURE (DAYS)	PERI- PHYTON BIOMASS ASH WEIGHT G/SQ M	PERI- PHYTON BIOMASS TOTAL DRY WEIGHT G/SQ M	CHLOR-A PERI- PHYTON CHROMO- GRAPHIC FLUOROM (MG/M2)	CHLOR-B PERI- PHYTON CHROMO- GRAPHIC FLUOROM (MG/M2)
NOV 16...	1600	28	.472	.551	.270	.000
MAY 16...	1300	20	.000	.157	.030	.000

## STREAMS TRIBUTARY TO DETROIT RIVER

04165700 DETROIT RIVER AT DETROIT, MI--CONTINUED

SPECIFIC CONDUCTANCE (MICROMHOS/CM AT 25 DEG. C), WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
ONCE-DAILY

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	214	206	224	217	231	214	200	206	220	218	208	216
2	204	216	204	201	222	215	203	211	225	225	215	216
3	204	216	201	208	216	204	202	209	220	240	208	224
4	212	198	201	205	215	202	206	207	215	215	218	210
5	204	201	205	204	219	206	206	200	225	210	218	212
6	204	202	218	224	215	203	200	200	210	218	212	210
7	201	205	220	218	215	200	196	205	228	220	210	212
8	205	208	207	217	210	205	210	206	220	218	208	218
9	200	209	218	218	226	216	200	206	224	216	216	210
10	215	216	208	217	220	205	202	205	229	218	208	209
11	210	216	209	204	215	205	211	210	227	220	198	211
12	214	216	215	232	205	200	206	220	218	218	212	212
13	208	211	217	210	215	206	211	224	210	225	208	208
14	214	224	216	200	220	200	213	227	198	210	213	198
15	218	215	206	200	200	206	211	245	218	212	208	213
16	221	214	206	206	215	200	209	229	220	208	210	218
17	219	221	204	206	227	216	222	220	224	196	211	208
18	216	212	216	206	227	222	263	218	208	208	219	218
19	219	214	202	208	228	222	345	231	220	208	226	203
20	214	216	204	236	213	214	255	216	224	216	218	217
21	200	204	206	228	228	216	218	213	224	222	220	208
22	202	204	206	228	215	229	204	224	220	223	218	208
23	205	204	216	224	239	218	219	226	226	218	229	208
24	210	204	208	231	227	211	224	225	229	218	217	218
25	210	216	206	228	206	217	219	227	227	226	208	210
26	217	209	216	206	228	206	221	216	230	222	208	210
27	203	216	216	224	229	202	206	208	227	219	208	218
28	225	216	216	227	222	208	211	208	218	210	215	218
29	214	226	222	237	---	243	206	224	227	215	208	208
30	214	226	219	229	---	227	206	229	213	210	206	210
31	214	---	208	232	---	204	---	226	---	210	218	---
MEAN	211	212	211	217	220	211	217	217	221	217	213	212
WTR YR 1978	MEAN	215	MAX	345	MIN	196						

TEMPERATURE (DEG. C) OF WATER, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	16.5	11.0	3.5	.5	.5	.5	1.0	8.5	18.5	21.5	21.5	21.5
2	16.5	11.0	3.0	.5	.5	.5	1.0	8.5	18.5	20.5	21.5	22.0
3	15.0	11.0	3.5	.5	.5	.5	.5	8.5	18.0	20.0	21.5	21.5
4	14.5	11.5	3.0	.5	.5	.5	.5	8.5	17.0	19.0	21.5	21.5
5	14.5	11.5	3.5	.5	.5	.5	1.0	8.5	16.5	19.5	21.5	21.5
6	14.0	11.5	1.5	.5	.5	.5	1.0	8.5	16.0	19.5	21.5	22.0
7	13.5	11.5	1.5	.5	.5	.5	1.5	8.5	16.5	20.0	22.0	22.0
8	13.5	11.5	1.0	.5	.5	.5	4.0	9.0	16.5	19.5	21.5	22.0
9	13.5	11.5	.5	.5	.5	.5	3.5	9.0	16.0	19.5	22.0	23.0
10	13.0	12.0	.5	.5	.5	.5	3.5	9.0	16.5	20.0	21.5	22.0
11	13.0	10.5	.5	.5	.5	.5	4.0	9.0	16.5	19.5	21.5	23.0
12	12.0	9.5	.5	.5	.5	.5	5.0	9.0	16.5	20.0	22.0	23.0
13	11.5	8.0	.5	.5	.5	.5	4.5	10.0	15.5	20.5	22.0	21.0
14	11.0	7.0	.5	.5	.5	.5	4.0	11.0	15.0	20.0	23.0	21.5
15	11.0	6.5	.5	.5	.5	.5	4.5	11.0	16.0	20.5	23.5	20.0
16	10.5	6.5	.5	.5	.5	.5	4.5	10.5	16.5	21.0	24.0	20.0
17	10.0	6.5	.5	.5	.5	.5	5.5	10.5	16.5	20.5	23.5	19.5
18	10.0	6.5	.5	.5	.5	.5	6.5	11.0	17.0	21.0	23.5	20.0
19	10.0	7.0	.5	.5	.5	.5	6.5	12.0	17.0	21.0	23.5	20.0
20	10.5	7.0	.5	.5	.5	.5	6.5	13.5	18.0	21.0	23.5	20.0
21	10.5	7.0	.5	.5	.5	.5	5.5	12.0	19.0	22.0	23.0	20.0
22	11.0	11.5	.5	.5	.5	1.0	5.0	11.5	18.5	22.0	23.5	19.5
23	11.0	11.5	.5	.5	.5	1.0	5.0	13.0	18.0	23.0	23.5	18.5
24	10.5	11.5	.5	.5	.5	1.0	5.5	14.0	18.0	21.0	23.0	18.0
25	11.0	11.0	.5	.5	.5	1.0	6.0	15.0	19.0	21.5	23.0	17.0
26	11.5	5.0	.5	.5	.5	1.0	6.5	15.5	19.5	23.0	23.5	17.0
27	11.5	4.0	.5	.5	.5	.5	7.0	16.0	19.0	23.5	23.5	16.5
28	11.5	3.5	.5	.5	.5	.5	7.0	17.0	19.5	23.0	23.0	16.5
29	11.5	2.0	.5	.5	---	.5	8.0	17.0	20.0	22.0	23.0	16.0
30	11.5	2.0	.5	.5	---	.5	8.0	18.5	21.0	21.5	22.0	15.5
31	11.5	---	.5	.5	---	.5	---	18.5	---	21.5	21.5	---
MEAN	12.0	8.5	1.0	.5	.5	.5	4.5	11.5	17.5	21.0	22.5	20.0
WTR YR 1978	MEAN	10.0	MAX	24.0	MIN	.5						

## STREAMS TRIBUTARY TO DETROIT RIVER

355

04166000 RIVER ROUGE AT BIRMINGHAM, MI

LOCATION.--Lat 42°32'45", long 83°13'25", in NW¼ sec.36, T.2 N., R.10 E., Oakland County, Hydrologic Unit 04090004, on left bank 25 ft (8 m) downstream from mouth of Quarton Lake outlet, and 100 ft (30 m) upstream from bridge on Maple Road, in Birmingham.

DRAINAGE AREA.--33.3 mi<sup>2</sup> (86.2 km<sup>2</sup>). Prior to water year 1971, drainage area was 36.9 mi<sup>2</sup> (95.6 km<sup>2</sup>). An area of 3.6 mi<sup>2</sup> (9.3 km<sup>2</sup>) noncontributing since then.

PERIOD OF RECORD.--June 1950 to current year.

REVISED RECORDS.--WSP 1387: 1951-52(M). WSP 1557: Drainage area.

GAGE.--Water-stage recorder. Concrete control since July 27, 1962. Datum of gage is 715.94 ft (218.219 m) National Geodetic Vertical Datum of 1929.

REMARKS.--Records good. Occasional regulation by Quarton Lake above station. Several observations of water temperature were made during the year.

AVERAGE DISCHARGE.--20 years (water years 1951-70), 15.3 ft<sup>3</sup>/s (0.433 m<sup>3</sup>/s), 5.63 in/yr (143 mm/yr); 8 years (water years 1971-78), 22.4 ft<sup>3</sup>/s (0.634 m<sup>3</sup>/s), 9.13 in/yr (232 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,390 ft<sup>3</sup>/s (39.4 m<sup>3</sup>/s) June 26, 1968, gage height, 8.70 ft (2.652 m); minimum, 0.10 ft<sup>3</sup>/s (0.003 m<sup>3</sup>/s) Aug. 8, 9, 1963; minimum gage height, 1.02 ft (0.311 m) Oct. 12, 1961.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 251 ft<sup>3</sup>/s (7.11 m<sup>3</sup>/s) Mar. 21, gage height, 3.46 ft (1.055 m), only peak above base of 180 ft<sup>3</sup>/s (5.10 m<sup>3</sup>/s); minimum, 2.3 ft<sup>3</sup>/s (0.065 m<sup>3</sup>/s) Sept. 4, gage height, 1.54 ft (0.469 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	18	6.8	70	13	15	12	43	17	14	13	4.4	3.4
2	14	6.8	32	13	15	13	33	16	19	16	4.7	4.2
3	8.2	6.1	19	13	15	13	43	15	8.7	12	8.7	3.6
4	6.8	6.1	15	13	15	12	47	15	12	11	7.9	2.8
5	6.1	6.8	14	14	15	12	46	21	9.6	10	6.5	3.1
6	5.8	19	13	13	14	12	44	20	9.2	8.7	6.1	3.1
7	5.8	19	12	13	14	13	44	16	10	7.5	6.5	3.9
8	21	20	11	13	14	13	33	20	15	7.2	9.6	3.6
9	18	15	10	13	14	13	30	33	12	6.8	12	3.6
10	9.6	52	10	13	14	15	35	20	9.6	6.1	7.5	3.1
11	8.7	21	10	12	14	17	66	17	8.2	5.1	6.1	7.5
12	8.7	15	10	11	14	21	39	25	12	4.7	5.8	10
13	7.5	12	12	12	14	28	32	85	14	5.1	5.4	17
14	7.2	11	47	12	13	100	28	70	9.6	5.1	5.4	18
15	7.2	13	39	12	13	83	25	45	8.7	4.2	5.1	14
16	6.8	17	31	12	13	59	23	34	9.6	4.4	6.5	9.6
17	5.8	17	31	12	13	54	22	29	9.2	4.2	6.1	24
18	6.5	14	45	12	13	41	23	26	8.2	3.9	5.8	59
19	5.4	11	44	12	13	53	30	23	7.5	3.6	11	51
20	5.8	18	43	12	12	73	51	31	7.2	4.4	8.2	20
21	5.4	25	39	13	12	205	36	37	37	4.4	5.8	11
22	6.5	15	29	12	12	122	31	26	15	4.4	5.8	8.2
23	7.2	12	25	12	12	95	27	24	9.6	3.9	5.4	7.5
24	6.8	13	24	12	12	63	30	22	8.2	3.4	5.4	7.2
25	6.5	13	28	13	13	44	26	21	17	3.9	5.1	7.2
26	5.8	12	20	28	13	54	23	18	40	3.6	5.8	6.5
27	6.5	10	17	25	13	58	21	13	18	3.6	5.1	6.8
28	5.8	10	15	20	13	47	21	13	13	3.9	5.1	7.2
29	5.4	9.6	14	18	---	44	19	12	7.9	5.4	5.1	5.4
30	6.1	13	14	17	---	36	18	16	8.2	4.7	3.6	5.4
31	6.1	---	14	16	---	39	---	18	---	4.4	3.6	---
TOTAL	251.0	439.2	757	436	377	1464	989	798	387.2	188.6	195.1	336.9
MEAN	8.10	14.6	24.4	14.1	13.5	47.2	33.0	25.7	12.9	6.08	6.29	11.2
MAX	21	52	70	28	15	205	66	85	40	16	12	59
MIN	5.4	6.1	10	11	12	12	18	12	7.2	3.4	3.6	2.8
CFSM	.24	.44	.73	.42	.41	1.42	.99	.77	.39	.18	.19	.34
IN.	.28	.49	.85	.49	.42	1.64	1.10	.89	.43	.21	.22	.38

CAL YR 1977 TOTAL 6583.9 MEAN 18.0 MAX 180 MIN 2.3 CFSM .54 IN 7.35  
WTR YR 1978 TOTAL 6619.0 MEAN 18.1 MAX 205 MIN 2.8 CFSM .54 IN 7.39



## STREAMS TRIBUTARY TO DETROIT RIVER

04166100 RIVER ROUGE AT SOUTHFIELD, MI

LOCATION.--Lat 42°26'52", long 83°17'52", in SW¼ sec.32, T.1 N., R.10 E., Oakland County, Hydrologic Unit 04090004, on right bank at downstream side of bridge on Beech Road at Southfield, 4.2 mi (6.8 km) east of Farmington.

DRAINAGE AREA.--87.9 mi<sup>2</sup> (227.7 km<sup>2</sup>).

PERIOD OF RECORD.--April 1958 to current year.

REVISED RECORDS.--WSP 2112: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 609.62 ft (185.812 m) city of Southfield datum. Prior to Sept. 30, 1958, nonrecording gage at same site and datum.

REMARKS.--Records good except those for the winter period, which are fair. Several observations of water temperature were made during the year.

AVERAGE DISCHARGE.--20 years, 57.6 ft<sup>3</sup>/s (1.631 m<sup>3</sup>/s), 8.90 in/yr (226 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 4,900 ft<sup>3</sup>/s (139 m<sup>3</sup>/s) June 26, 1968, gage height, 19.04 ft (5.803 m); minimum, 0.1 ft<sup>3</sup>/s (0.003 m<sup>3</sup>/s) Aug. 2, 1964, gage height, 1.15 ft (0.351 m).

EXTREMES FOR CURRENT YEAR.--Peak discharges above base of 500 ft<sup>3</sup>/s (14.2 m<sup>3</sup>/s) and maximum (\*):

Date	Time	Discharge (ft <sup>3</sup> /s) (m <sup>3</sup> /s)	Gage height (ft) (m)	Date	Time	Discharge (ft <sup>3</sup> /s) (m <sup>3</sup> /s)	Gage height (ft) (m)
Mar. 22	0300	*912 25.8	*9.91 3.021	May 13	2100	571 16.2	8.26 2.518

Minimum discharge, 7.5 ft<sup>3</sup>/s (0.21 m<sup>3</sup>/s) Sept. 10, gage height, 2.43 ft (0.741 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	62	18	282	32	40	30	115	47	49	22	11	8.4
2	52	19	126	31	38	30	93	45	56	47	10	8.4
3	29	18	64	31	37	30	120	42	41	36	16	8.9
4	22	18	49	31	36	30	137	41	32	29	18	8.7
5	19	17	42	31	35	30	162	55	37	26	14	8.2
6	18	33	42	31	34	30	128	62	30	23	12	8.3
7	17	44	40	31	34	30	170	49	32	20	13	8.0
8	60	37	35	31	34	31	101	55	44	18	19	8.7
9	68	31	33	31	33	31	85	105	37	16	25	8.0
10	33	165	31	31	33	32	84	70	29	15	25	8.0
11	25	64	35	31	32	45	250	53	25	14	14	9.5
12	30	37	48	30	32	50	135	80	37	13	12	30
13	24	29	268	30	32	70	95	299	46	14	11	29
14	20	25	183	30	31	130	82	327	30	16	10	46
15	19	32	114	29	31	320	71	178	24	13	10	49
16	21	54	108	29	31	190	65	115	28	11	14	25
17	20	52	179	29	31	140	61	90	31	11	14	64
18	19	40	152	29	30	90	60	80	23	11	12	95
19	19	30	155	28	30	120	80	68	21	10	30	97
20	18	52	123	28	30	254	261	77	19	10	28	45
21	17	74	85	28	30	571	135	124	120	12	14	26
22	18	42	71	29	30	665	94	75	50	13	12	20
23	19	33	67	29	30	398	80	63	29	11	11	18
24	19	36	77	29	30	226	87	59	23	10	11	16
25	18	34	47	31	30	139	77	53	26	9.7	11	16
26	18	41	40	37	30	157	66	48	158	10	10	16
27	17	26	37	76	30	207	60	41	63	11	11	15
28	17	24	35	66	30	140	56	37	35	9.8	11	22
29	17	21	34	54	---	123	53	34	27	19	11	15
30	16	23	33	48	---	98	51	47	23	15	10	14
31	17	---	32	44	---	107	---	102	---	11	9.0	---
TOTAL	788	1169	2667	1075	904	4544	3114	2621	1225	506.5	439.0	751.1
MEAN	25.4	39.0	86.0	34.7	32.3	147	104	84.5	40.8	16.3	14.2	25.0
MAX	68	165	282	76	40	665	261	327	158	47	30	97
MIN	16	17	31	28	30	30	51	34	19	9.7	9.0	8.0
CFSM	.29	.44	.98	.40	.37	1.67	1.18	.96	.46	.19	.16	.28
IN.	.33	.49	1.13	.45	.38	1.92	1.32	1.11	.52	.21	.19	.32

CAL YR 1977 TOTAL 23559.6 MEAN 64.5 MAX 975 MIN 8.4 CFSM .73 IN 9.97  
WTR YR 1978 TOTAL 19803.6 MEAN 54.3 MAX 665 MIN 8.0 CFSM .62 IN 8.38

STREAMS TRIBUTARY TO DETROIT RIVER

357

04166200 EVANS DITCH AT SOUTHFIELD, MI

LOCATION.--Lat 42°27'28", long 83°16'03", in SE¼ sec.28, T.1 N., R.10 E., Oakland County, Hydrologic Unit 04090004, on right bank 20 ft (6 m) upstream from bridge on Nine-Mile Road, at Southfield, 1.6 mi (2.6 km) upstream from mouth, and 5.5 mi (8.8 km) east of Farmington.

DRAINAGE AREA.--9.49 mi<sup>2</sup> (24.58 km<sup>2</sup>).

PERIOD OF RECORD.--September 1958 to current year.

GAGE.--Water-stage recorder and concrete control. Datum of gage is 615.07 ft (187.473 m) city of Southfield datum.

REMARKS.--Records good except those for the winter period, which are fair. Several observations of water temperature were made during the year.

AVERAGE DISCHARGE.--20 years, 8.21 ft<sup>3</sup>/s (0.233 m<sup>3</sup>/s), 11.75 in/yr (298 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 903 ft<sup>3</sup>/s (25.6 m<sup>3</sup>/s) June 25, 1968, gage height, 12.95 ft (3.947 m), from rating curve extended above 410 ft<sup>3</sup>/s (11.6 m<sup>3</sup>/s); no flow part of each day Aug. 30, 31, 1978.

EXTREMES FOR CURRENT YEAR.--Peak discharges above base of 200 ft<sup>3</sup>/s (5.66 m<sup>3</sup>/s) and maximum (\*):

Date	Time	Discharge (ft <sup>3</sup> /s) (m <sup>3</sup> /s)	Gage height (ft) (m)	Date	Time	Discharge (ft <sup>3</sup> /s) (m <sup>3</sup> /s)	Gage height (ft) (m)
May 13	1100	235 6.66	8.12 2.475	May 30	2000	*283 8.01	*8.48 2.585

No flow part of each day Aug. 30, 31.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	23	2.0	4.7	3.5	4.3	2.6	15	2.6	6.0	4.9	.24	.86
2	6.1	1.8	8.6	3.5	4.0	2.6	12	2.6	5.9	8.0	.10	.66
3	3.3	1.4	6.1	3.4	3.8	2.6	26	2.5	4.1	3.5	.65	.63
4	2.6	1.5	4.8	3.4	3.6	2.6	25	2.8	3.7	2.7	.51	.55
5	2.4	2.9	4.2	3.3	3.5	2.6	17	9.4	6.1	2.2	.82	1.2
6	2.3	11	4.2	3.5	3.3	2.6	29	5.4	3.3	2.3	1.0	.93
7	2.2	7.8	3.8	3.7	3.2	2.6	22	3.4	8.3	2.0	2.7	.99
8	24	5.8	3.5	4.0	3.1	2.6	12	18	6.4	2.1	3.7	1.3
9	5.4	3.9	3.2	3.7	3.0	3.0	11	9.6	3.7	2.1	5.3	1.6
10	3.3	40	3.1	3.5	3.0	10	25	5.1	2.9	2.0	3.6	1.8
11	5.1	3.9	3.0	3.4	2.9	6.0	33	5.2	3.1	1.9	1.1	2.4
12	4.6	2.9	3.6	3.3	2.9	14	14	12	22	1.8	1.3	8.2
13	1.7	2.3	9.5	3.3	2.9	10	11	59	5.5	2.6	1.3	5.3
14	1.7	2.1	62	3.2	2.8	100	9.0	25	3.3	2.1	1.9	16
15	1.7	7.7	21	3.2	2.8	41	7.7	15	2.9	2.2	1.9	5.3
16	3.0	10	18	3.2	2.8	32	7.2	9.7	6.2	1.7	4.0	2.9
17	1.3	7.4	15	3.1	2.8	23	6.5	7.5	3.3	3.1	.96	17
18	1.8	4.5	31	3.1	2.8	15	8.2	6.7	2.5	1.8	1.5	14
19	1.8	2.8	15	3.1	2.7	29	35	6.0	2.1	1.1	6.2	2.6
20	1.6	20	31	3.1	2.7	26	57	27	1.9	1.1	2.1	1.6
21	1.6	8.4	13	3.1	2.7	95	15	11	26	2.2	1.0	1.3
22	3.4	4.0	8.9	3.1	2.7	32	10	6.1	3.1	2.0	1.3	.95
23	1.9	5.0	7.9	3.0	2.7	23	9.4	5.0	2.7	1.6	1.4	.98
24	1.4	4.8	8.8	3.0	2.7	14	10	4.8	2.2	.88	1.5	.96
25	1.5	7.9	14	3.7	2.7	11	7.8	4.6	15	1.0	1.5	.61
26	1.6	4.9	5.5	20	2.7	29	7.2	4.1	38	1.8	1.6	.67
27	1.5	2.9	4.4	8.0	2.6	18	5.5	3.8	5.3	1.7	1.8	3.4
28	1.3	2.8	4.1	6.0	2.6	14	4.6	3.4	3.4	1.3	1.2	2.2
29	1.6	3.1	3.8	5.3	---	11	4.2	4.0	3.0	7.2	.42	.46
30	1.4	14	3.7	5.0	---	10	2.9	50	2.8	.75	.22	1.5
31	1.3	---	3.6	4.5	---	17	---	12	---	.17	.22	---
TOTAL	117.4	199.5	375.3	132.2	84.3	603.8	459.2	343.3	204.7	71.80	53.04	98.85
MEAN	3.79	6.65	12.1	4.26	3.01	19.5	15.3	11.1	6.82	2.32	1.71	3.30
MAX	24	40	62	20	4.3	100	57	59	38	8.0	6.2	17
MIN	1.3	1.4	3.0	3.0	2.6	2.6	2.9	2.5	1.9	.17	.10	.46
CFSM	.40	.70	1.28	.45	.32	2.06	1.61	1.17	.72	.24	.18	.35
IN.	.46	.78	1.47	.52	.33	2.37	1.80	1.35	.80	.28	.21	.39

CAL YR 1977 TOTAL 2973.94 MEAN 8.15 MAX 258 MIN .80 CFSM .86 IN 11.66  
WTR YR 1978 TOTAL 2743.39 MEAN 7.52 MAX 100 MIN .10 CFSM .79 IN 10.75

## STREAMS TRIBUTARY TO DETROIT RIVER

04166300 UPPER RIVER ROUGE AT FARMINGTON, MI

LOCATION.--Lat 42°27'52", long 83°22'11", in NW¼ sec.27, T.1 N., R.9 E., Oakland County, Hydrologic Unit 04090004, on left bank 800 ft (244 m) downstream from bridge on Shiawassee Road at Farmington.

DRAINAGE AREA.--17.5 mi<sup>2</sup> (45.3 km<sup>2</sup>).

PERIOD OF RECORD.--March 1958 to current year.

REVISED RECORDS.--WSP 1912: 1959(M), 1960(M).

GAGE.--Water-stage recorder and concrete control. Datum of gage is 690.4 ft (210.43 m) National Geodetic Vertical Datum of 1929.

REMARKS.--Records good except those for the winter period, which are fair. Several observations of water temperature were made during the year.

AVERAGE DISCHARGE.--20 years, 11.3 ft<sup>3</sup>/s (0.320 m<sup>3</sup>/s), 8.77 in/yr (223 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,500 ft<sup>3</sup>/s (42.5 m<sup>3</sup>/s) June 25, 1968, gage height, 8.70 ft (2.652 m); minimum, 0.07 ft<sup>3</sup>/s (0.002 m<sup>3</sup>/s) Aug. 30, 1966, result of regulation; minimum daily, 0.32 ft<sup>3</sup>/s (0.009 m<sup>3</sup>/s) Aug. 10, 1964, Aug. 29, 1966.

EXTREMES FOR CURRENT YEAR.--Peak discharges above base of 80 ft<sup>3</sup>/s (2.27 m<sup>3</sup>/s) and maximum (\*):

Date	Time	Discharge (ft <sup>3</sup> /s) (m <sup>3</sup> /s)	Gage height (ft) (m)	Date	Time	Discharge (ft <sup>3</sup> /s) (m <sup>3</sup> /s)	Gage height (ft) (m)
Dec. 1	1100	82 2.32	3.78 1.152	Apr. 10	2400	81 2.29	3.81 1.161
Mar. 13	0100	145 4.11	4.21 1.283	May 13	1700	133 3.77	4.14 1.262
Mar. 14	1500	179 5.07	4.42 1.347	May 30	2300	114 3.23	4.00 1.219
Mar. 21	1000	*210 5.95	*4.59 1.399				

Minimum discharge, 1.3 ft<sup>3</sup>/s (0.037 m<sup>3</sup>/s) Sept. 7, gage height, 2.78 ft (0.847 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	12	4.5	5.6	5.8	5.9	4.2	25	8.7	24	7.4	5.1	1.9
2	7.4	4.5	23	5.4	5.4	4.2	20	8.7	24	13	4.0	1.7
3	5.4	4.3	12	5.0	5.0	4.2	24	8.8	17	11	5.8	1.7
4	4.6	4.1	8.9	4.8	4.9	4.2	28	8.8	13	9.0	4.5	1.8
5	4.1	3.9	7.2	4.6	4.8	4.2	28	12	13	7.8	3.9	1.8
6	4.1	4.5	7.0	4.5	4.7	4.2	29	13	11	7.4	3.6	1.7
7	3.9	5.2	6.8	4.4	4.6	4.2	29	12	12	7.2	3.8	1.6
8	16	5.7	6.4	4.3	4.6	4.2	21	17	13	6.6	4.3	1.7
9	9.1	6.0	8.3	4.3	4.5	10	18	29	12	6.4	5.1	1.6
10	6.2	20	6.9	4.2	4.5	21	26	18	9.2	5.8	5.9	1.7
11	5.6	8.9	6.8	4.2	4.4	40	51	14	7.7	5.7	3.9	1.8
12	6.1	6.8	8.5	4.2	4.4	76	28	19	9.3	5.6	3.3	5.7
13	5.0	5.5	12	4.1	4.4	118	22	79	9.6	5.4	2.5	4.8
14	4.9	5.4	37	4.1	4.3	116	18	74	8.0	5.6	2.6	5.9
15	5.1	6.0	29	4.1	4.3	60	16	44	7.1	5.5	2.1	6.1
16	5.2	9.0	20	4.1	4.3	48	15	32	8.3	5.3	3.4	3.5
17	4.7	8.4	20	4.0	4.3	42	14	25	8.4	5.0	2.8	9.5
18	4.6	7.0	38	4.0	4.3	31	13	23	7.7	4.3	4.3	15
19	4.4	6.1	31	4.0	4.2	40	20	20	6.7	4.4	6.9	6.2
20	4.3	11	26	4.0	4.2	58	48	24	6.4	4.5	3.9	4.3
21	4.3	11	21	4.0	4.2	164	29	30	41	4.8	3.1	3.3
22	4.3	7.2	15	4.0	4.2	98	22	19	17	4.8	2.9	3.0
23	4.2	7.1	12	4.0	4.2	75	17	16	10	4.3	2.5	2.9
24	4.3	7.1	11	4.0	4.2	53	17	15	8.5	4.2	2.4	2.6
25	3.9	6.4	13	4.0	4.2	35	15	13	12	4.1	2.0	2.4
26	4.0	6.5	10	17	4.2	38	13	12	36	3.7	2.3	2.4
27	4.3	5.2	9.0	17	4.2	38	11	11	16	4.2	1.6	2.5
28	4.2	5.2	8.0	11	4.2	31	11	10	10	3.9	1.7	3.6
29	4.1	5.2	7.4	8.5	---	28	10	9.2	8.1	6.3	1.8	2.9
30	4.5	6.6	6.8	7.4	---	22	9.4	37	7.5	4.8	2.0	3.2
31	4.5	---	6.2	6.4	---	25	---	56	---	5.0	1.9	---
TOTAL	169.3	204.3	490.2	175.4	125.6	1300.6	647.4	718.2	393.5	183.0	105.9	108.8
MEAN	5.46	6.81	15.8	5.66	4.49	42.0	21.6	23.2	13.1	5.90	3.42	3.63
MAX	16	20	56	17	5.9	164	51	79	41	13	6.9	15
MIN	3.9	3.9	6.2	4.0	4.2	4.2	9.4	8.7	6.4	3.7	1.6	1.6
CFSM	.31	.39	.90	.32	.26	2.40	1.23	1.33	.75	.34	.20	.21
IN.	.36	.43	1.04	.37	.27	2.76	1.38	1.53	.84	.39	.23	.23

CAL YR 1977 TOTAL 4231.7 MEAN 11.6 MAX 166 MIN 1.2 CFSM .66 IN 8.99  
WTR YR 1978 TOTAL 4622.2 MEAN 12.7 MAX 164 MIN 1.6 CFSM .73 IN 9.82

## 04166500 RIVER ROUGE AT DETROIT, MI

LOCATION.--Lat 42°22'20", long 83°15'20", in SW¼ sec.27, T.1 S., R.10 E., Wayne County, Hydrologic Unit 04090004, on right bank 500 ft (152 m) upstream from bridge on Plymouth Road in Detroit, and 4 mi (6 km) upstream from Middle River Rouge.

DRAINAGE AREA.--187 mi<sup>2</sup> (484 km<sup>2</sup>).

PERIOD OF RECORD.--October 1930 to current year. Monthly discharge only for some periods, published in WSP 1307.

REVISED RECORDS.--WSP 1034: 1933(M). WSP 1054: 1939, 1943, 1945(M). WSP 1437: 1931-32, 1934, 1936(M), 1937-38, 1944(M), 1945. WSP 2112: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 584.00 ft (178.003 m) National Geodetic Vertical Datum of 1929. Prior to Oct. 16, 1948, nonrecording gage at site 1 mi (2 km) downstream at datum 4.6 ft (1.4 m) lower.

REMARKS.--Records good except those for the winter period, which are fair. Several observations of water temperature were made during the year. National Weather Service gage-height telemark at station.

AVERAGE DISCHARGE.--48 years, 113 ft<sup>3</sup>/s (3.200 m<sup>3</sup>/s), 8.21 in/yr (209 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 13,000 ft<sup>3</sup>/s (368 m<sup>3</sup>/s) Apr. 5, 1947; maximum gage height, 23.0 ft (7.01 m) Apr. 6, 1947, from floodmark, site and datum then in use; minimum discharge, 1.8 ft<sup>3</sup>/s (0.051 m<sup>3</sup>/s) Aug. 1, 2, 1964, gage height, 3.00 ft (0.914 m).

EXTREMES FOR CURRENT YEAR.--Peak discharges above base of 1,200 ft<sup>3</sup>/s (34.0 m<sup>3</sup>/s) and maximum (\*):

Date	Time	Discharge (ft <sup>3</sup> /s) (m <sup>3</sup> /s)	Gage height (ft) (m)	Date	Time	Discharge (ft <sup>3</sup> /s) (m <sup>3</sup> /s)	Gage height (ft) (m)
Mar. 15	0300	1390 39.4	12.10 3.688	Mar. 21	2200	*1460 41.3	*12.34 3.761

Minimum discharge, 22 ft<sup>3</sup>/s (0.62 m<sup>3</sup>/s) July 28; minimum gage height, 3.83 ft (1.167 m) Sept. 7, 8.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	195	36	564	80	78	56	220	87	119	48	30	27
2	131	38	312	78	73	56	181	84	107	97	28	27
3	65	34	128	76	70	56	244	81	89	88	33	26
4	48	35	96	74	68	56	265	78	68	58	40	29
5	41	32	80	72	66	56	313	108	76	52	34	29
6	38	49	82	70	65	56	281	119	62	47	30	31
7	35	89	75	69	64	56	365	100	72	41	37	27
8	170	76	70	68	63	56	210	177	95	37	54	26
9	149	62	65	67	62	63	173	244	72	34	46	28
10	71	348	62	66	61	77	196	136	58	31	82	29
11	56	131	58	64	60	110	595	104	53	30	42	50
12	83	74	56	63	60	190	275	147	107	27	35	58
13	54	57	93	62	60	360	187	509	134	28	31	79
14	47	51	518	62	60	883	154	695	58	34	30	136
15	42	64	439	62	59	1140	136	346	47	32	29	132
16	43	112	243	61	59	575	123	216	61	28	41	73
17	39	108	228	61	58	440	118	159	69	28	47	137
18	36	80	333	60	58	293	117	143	47	28	32	172
19	38	61	347	60	58	284	168	122	42	27	43	138
20	35	124	318	60	58	480	639	135	41	28	73	86
21	35	162	303	60	57	1110	298	240	342	43	43	58
22	42	86	164	60	57	1130	186	130	118	57	35	47
23	42	72	132	59	57	618	150	106	62	33	32	42
24	36	75	126	59	57	388	155	97	47	31	32	39
25	38	77	171	65	56	266	137	89	58	28	32	37
26	35	90	117	135	56	293	119	83	440	40	30	35
27	32	56	100	140	56	376	107	75	179	64	31	34
28	33	65	95	125	56	254	101	68	79	26	35	59
29	32	56	93	100	---	237	97	63	61	107	34	39
30	32	73	86	93	---	196	96	205	49	52	31	38
31	31	---	82	85	---	204	---	464	---	33	29	---
TOTAL	1804	2473	5636	2316	1712	10415	6406	5410	2912	1337	1181	1768
MEAN	58.2	82.4	182	74.7	61.1	336	214	175	97.1	43.1	38.1	58.9
MAX	195	348	564	140	78	1140	639	695	440	107	82	172
MIN	31	32	56	59	56	56	96	63	41	26	28	26
CFSM	.31	.44	.97	.40	.33	1.80	1.14	.94	.52	.23	.20	.32
IN.	.36	.49	1.12	.46	.34	2.07	1.27	1.08	.58	.27	.23	.35
CAL YR 1977	TOTAL	46281	MEAN 127	MAX 1910	MIN 12	CFSM .68	IN 9.21					
WTR YR 1978	TOTAL	43370	MEAN 119	MAX 1140	MIN 26	CFSM .64	IN 8.63					

## STREAMS TRIBUTARY TO DETROIT RIVER

04168000 LOWER RIVER ROUGE AT INKSTER, MI

LOCATION.--Lat 42°18'00", long 83°18'00", in SW¼ SE¼ sec.19, T.2 S., R.10 E., Wayne County, Hydrologic Unit 04090004, on right bank 10 ft (3 m) downstream from bridge on John Daly Road, 0.6 mi (1.0 km) northeast of Inkster, and 4.8 mi (7.7 km) upstream from mouth.

DRAINAGE AREA.--83.2 mi<sup>2</sup> (215.5 km<sup>2</sup>).

PERIOD OF RECORD.--June 1947 to current year.

REVISED RECORDS.--WSP 1174: 1948 (M). WSP 1437: 1949. WSP 2112: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 593.14 ft (180.789 m) National Geodetic Vertical Datum of 1929. Prior to Oct. 20, 1948, nonrecording gage at same site and datum.

REMARKS.--Records good except those for the winter period, which are fair. Several observations of water temperature were made during the year.

AVERAGE DISCHARGE.--31 years, 51.4 ft<sup>3</sup>/s (1.456 m<sup>3</sup>/s), 8.39 in/yr (213 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 3,600 ft<sup>3</sup>/s (102 m<sup>3</sup>/s) June 26, 1968, gage height, 13.62 ft (4.151 m); minimum, 0.2 ft<sup>3</sup>/s (0.006 m<sup>3</sup>/s) Sept. 13, 1955, Jan. 23, 1961.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 1,540 ft<sup>3</sup>/s (43.6 m<sup>3</sup>/s) Mar. 22, gage height, 10.65 ft (3.246 m), only peak above base of 900 ft<sup>3</sup>/s (25.5 m<sup>3</sup>/s); minimum, 0.4 ft<sup>3</sup>/s (0.011 m<sup>3</sup>/s) Sept. 9; minimum gage height, 2.58 ft (0.786 m) Sept. 5.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	69	12	287	22	22	12	185	27	55	12	5.8	1.1
2	44	7.0	212	19	20	12	104	25	37	23	4.7	1.2
3	20	7.6	79	19	19	12	138	25	26	25	8.0	1.0
4	14	6.5	51	19	18	12	190	25	20	17	3.1	1.0
5	9.8	5.6	36	19	17	12	234	35	19	13	3.0	.72
6	7.4	9.0	28	18	16	12	240	32	15	11	2.7	.72
7	6.8	21	24	18	16	12	478	26	27	8.5	40	.81
8	65	15	21	18	15	12	175	57	41	6.9	17	.81
9	38	14	19	18	15	20	110	86	21	5.4	6.8	.63
10	21	110	17	17	15	30	122	46	14	4.9	3.5	1.1
11	18	41	21	17	15	45	435	35	11	4.1	3.0	6.6
12	15	23	26	16	14	70	208	53	29	3.3	3.1	8.6
13	13	16	41	16	14	162	113	204	46	3.6	2.8	20
14	11	13	305	16	14	512	79	437	22	7.3	2.3	40
15	8.5	17	401	15	14	689	61	330	15	5.0	2.1	20
16	7.4	21	287	15	14	642	50	241	23	4.5	17	54
17	6.9	22	277	15	14	585	44	129	15	4.4	7.8	73
18	6.2	19	395	15	13	393	49	92	12	4.7	5.0	85
19	6.4	15	399	14	13	361	84	69	9.5	4.6	2.5	12
20	6.3	41	345	14	13	638	312	102	9.0	4.3	2.0	4.6
21	7.0	45	353	14	13	1050	281	109	133	8.6	1.9	2.5
22	13	29	140	14	13	1220	142	61	35	11	1.8	1.4
23	9.8	26	103	14	13	465	89	45	17	5.6	1.9	1.1
24	6.6	25	94	14	13	284	74	41	13	5.9	1.6	.99
25	6.1	30	110	14	13	160	65	38	23	8.5	1.5	1.1
26	5.5	29	90	45	12	142	56	28	140	11	1.7	1.2
27	6.0	19	70	45	12	198	44	22	76	19	1.9	1.4
28	5.2	15	50	40	12	177	37	20	38	6.3	1.9	2.2
29	5.6	14	35	34	---	189	33	17	20	48	1.6	1.1
30	6.2	33	28	28	---	116	30	41	12	11	1.6	2.4
31	5.9	---	25	25	---	156	---	157	---	5.4	1.8	---
TOTAL	470.6	700.7	4369	627	412	8400	4262	2655	973.5	312.8	161.4	348.28
MEAN	15.2	23.4	141	20.2	14.7	271	142	85.6	32.5	10.1	5.21	11.6
MAX	69	110	401	45	22	1220	478	437	140	48	40	85
MIN	5.2	5.6	17	14	12	12	30	17	9.0	3.3	1.5	.63
CFSM	.18	.28	1.70	.24	.18	3.26	1.71	1.03	.39	.12	.06	.14
IN.	.21	.31	1.95	.28	.18	3.76	1.91	1.19	.44	.14	.07	.16

CAL YR 1977 TOTAL 19136.60 MEAN 52.4 MAX 1080 MIN 2.0 CFSM .63 IN 8.56  
WTR YR 1978 TOTAL 23692.28 MEAN 64.9 MAX 1220 MIN .63 CFSM .78 IN 10.59



## STREAMS TRIBUTARY TO LAKE ERIE

361

04170000 HURON RIVER AT MILFORD, MI

LOCATION.--Lat 42°34'44", long 83°37'36", in NE¼ sec.16, T.2 N., R.7 E., Oakland County, Hydrologic Unit 04090005, on left bank 40 ft (12 m) downstream from bridge on General Motors Road, 0.5 mi (0.8 km) downstream from Sherwood Creek, and 0.5 mi (0.8 km) west of Milford.

DRAINAGE AREA.--132 mi<sup>2</sup> (342 km<sup>2</sup>).

PERIOD OF RECORD.--September 1948 to current year.

REVISED RECORDS.--WSP 1337: 1952(m). WSP 2112: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 880.00 ft (268.224 m) National Geodetic Vertical Datum of 1929. Prior to Apr. 1, 1970, at site 240 ft (73 m) upstream at same datum.

REMARKS.--Records good. Flow below about 300 ft<sup>3</sup>/s (8.50 m<sup>3</sup>/s) regulated by powerplant 1.5 mi (2.4 km) above station prior to May 20, 1957; occasional regulation for lake level control since. Several observations of water temperature were made during the year.

AVERAGE DISCHARGE.--30 years, 97.2 ft<sup>3</sup>/s (2.753 m<sup>3</sup>/s), 10.00 in/yr (254 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 645 ft<sup>3</sup>/s (18.3 m<sup>3</sup>/s) Apr. 5, 1950; maximum gage height, 8.26 ft (2.518 m) June 28, 1968; minimum daily discharge, 5.2 ft<sup>3</sup>/s (0.15 m<sup>3</sup>/s) Oct. 21, 1971.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 215 ft<sup>3</sup>/s (6.09 m<sup>3</sup>/s) Mar. 24, gage height, 6.12 ft (1.865 m); minimum, 6.1 ft<sup>3</sup>/s (0.17 m<sup>3</sup>/s) Oct. 15, gage height, 3.86 ft (1.177 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	65	50	106	81	79	68	178	74	81	47	33	27
2	71	48	121	83	79	67	192	68	79	53	35	27
3	69	47	113	82	79	68	192	48	73	53	48	28
4	106	45	103	81	78	66	190	37	70	49	42	27
5	107	44	95	82	77	66	194	41	71	48	38	26
6	50	46	90	84	78	65	198	55	70	47	35	25
7	15	54	86	84	78	64	188	60	67	46	35	25
8	43	61	82	84	78	64	185	65	74	43	34	26
9	65	67	84	81	77	63	178	84	75	42	34	26
10	84	76	83	78	76	64	174	88	70	40	35	25
11	88	75	80	79	76	65	172	91	65	39	34	25
12	75	69	77	75	77	66	174	104	65	37	32	33
13	74	56	77	77	79	71	164	132	64	36	31	36
14	47	52	97	80	76	89	160	179	57	36	30	37
15	26	52	107	77	79	108	153	177	54	34	33	37
16	54	58	107	75	82	108	146	166	52	33	39	36
17	56	62	109	74	81	105	136	154	54	34	37	44
18	56	60	113	73	79	99	128	140	51	35	37	63
19	57	57	124	74	76	98	120	126	49	34	43	68
20	59	65	126	74	72	115	127	117	42	31	39	65
21	59	83	122	75	70	161	132	122	76	30	35	60
22	61	80	114	75	68	202	129	112	103	30	33	54
23	62	72	105	72	68	209	120	103	83	30	33	49
24	60	68	98	72	67	210	116	91	63	30	32	44
25	59	67	96	72	68	196	114	88	56	28	32	41
26	56	64	92	85	69	185	108	85	70	27	32	38
27	52	65	87	90	69	185	100	79	77	31	30	37
28	50	64	82	91	68	182	92	73	67	33	30	37
29	48	64	80	87	---	179	85	68	54	35	29	35
30	47	66	79	83	---	174	79	68	49	36	29	35
31	48	---	79	81	---	175	---	83	---	34	28	---
TOTAL	1869	1837	3014	2461	2103	3637	4424	2978	1981	1161	1067	1136
MEAN	60.3	61.2	97.2	79.4	75.1	117	147	96.1	66.0	37.5	34.4	37.9
MAX	107	83	126	91	82	210	198	179	103	53	48	68
MIN	15	44	77	72	67	63	79	37	42	27	28	25
CFSM	.46	.46	.74	.60	.57	.89	1.11	.73	.50	.28	.26	.29
IN.	.53	.52	.85	.69	.59	1.02	1.25	.84	.56	.33	.30	.32
CAL YR 1977	TOTAL	27450	MEAN 75.2	MAX 242	MIN 15	CFSM .57	IN 7.74					
WTR YR 1978	TOTAL	27668	MEAN 75.8	MAX 210	MIN 15	CFSM .57	IN 7.80					

## STREAMS TRIBUTARY TO LAKE ERIE

04170500 HURON RIVER NEAR NEW HUDSON, MI

LOCATION.--Lat 42°30'45", long 83°40'35", in NE¼ sec.1, T.1 N., R.6 E., Livingston County, Hydrologic Unit 04090005, on right bank 150 ft (46 m) downstream from Kent Lake Dam, 2 mi (3 km) upstream from Woodruff Creek, and 3 mi (5 km) west of New Hudson.

DRAINAGE AREA.--148 mi<sup>2</sup> (383 km<sup>2</sup>).

PERIOD OF RECORD.--August 1948 to current year.

REVISED RECORDS.--WSP 2112: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 868.00 ft (264.566 m) National Geodetic Vertical Datum of 1929.

REMARKS.--Records good. Occasional regulation by Kent Lake. Several observations of water temperature were made during the year.

AVERAGE DISCHARGE.--30 years, 111 ft<sup>3</sup>/s (3.144 m<sup>3</sup>/s), 10.18 in/yr (259 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,080 ft<sup>3</sup>/s (30.6 m<sup>3</sup>/s) Dec. 29, 1950, gage height, 5.05 ft (1.539 m), from rating curve extended above 600 ft<sup>3</sup>/s (17.0 m<sup>3</sup>/s); minimum, 2.6 ft<sup>3</sup>/s (0.074 m<sup>3</sup>/s) May 27, 1963, gage height, 0.53 ft (0.162 m); minimum daily, 6.4 ft<sup>3</sup>/s (0.18 m<sup>3</sup>/s) May 7, 1963.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 293 ft<sup>3</sup>/s (8.30 m<sup>3</sup>/s) Nov. 12, gage height, 2.68 ft (0.817 m); minimum daily, 25 ft<sup>3</sup>/s (0.71 m<sup>3</sup>/s) Sept. 6.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	99	158	131	110	100	88	105	41	86	59	35	28
2	93	127	136	111	100	87	116	39	87	63	34	26
3	93	112	146	106	100	88	96	50	86	61	53	28
4	95	105	142	99	98	85	98	51	82	59	51	26
5	116	148	139	98	97	86	150	57	84	55	48	26
6	110	180	134	98	96	85	105	62	79	53	45	25
7	85	144	127	99	96	84	121	68	80	52	44	26
8	79	123	125	101	96	82	162	76	85	50	38	28
9	84	117	128	102	96	81	169	83	81	48	40	29
10	89	119	121	96	94	82	169	92	77	47	42	28
11	103	118	118	96	94	83	172	77	73	42	39	28
12	107	176	108	94	95	84	168	89	76	39	38	37
13	106	219	107	98	97	87	93	83	75	39	36	40
14	102	154	116	98	97	100	100	151	65	42	34	38
15	83	127	123	94	97	115	125	164	62	40	31	43
16	82	120	126	93	97	122	135	159	62	39	35	47
17	80	114	128	92	98	126	140	154	63	36	39	55
18	83	110	135	92	98	125	138	149	66	35	42	69
19	86	107	140	92	96	125	132	134	67	36	46	72
20	87	212	148	94	94	131	139	130	59	38	46	71
21	87	211	149	94	92	185	142	132	76	37	42	73
22	94	167	146	92	90	194	139	121	86	35	39	68
23	94	141	138	90	89	223	110	115	92	38	36	60
24	92	127	133	90	89	283	43	110	82	35	36	55
25	92	142	129	95	88	271	75	105	74	32	34	51
26	94	139	123	105	88	269	93	98	80	30	32	45
27	92	156	121	115	88	269	100	96	82	33	32	46
28	92	188	115	115	89	259	104	93	80	31	30	47
29	90	145	110	110	---	243	104	87	73	34	31	45
30	90	127	107	105	---	165	104	86	65	38	29	45
31	149	---	107	100	---	118	---	89	---	35	30	---
TOTAL	2928	4333	3956	3074	2649	4425	3647	3041	2285	1311	1187	1305
MEAN	94.5	144	128	99.2	94.6	143	122	98.1	76.2	42.3	38.3	43.5
MAX	149	219	149	115	100	283	172	164	92	63	53	73
MIN	79	105	107	90	88	81	43	39	59	30	29	25
CFSM	.64	.97	.87	.67	.64	.97	.82	.66	.52	.29	.26	.29
IN.	.74	1.09	.99	.77	.67	1.11	.92	.76	.57	.33	.30	.33

CAL YR 1977 TOTAL 34760 MEAN 95.2 MAX 222 MIN 20 CFSM .64 IN 8.74  
WTR YR 1978 TOTAL 34141 MEAN 93.5 MAX 283 MIN 25 CFSM .63 IN 8.58

## STREAMS TRIBUTARY TO LAKE ERIE

363

04172000 HURON RIVER NEAR HAMBURG, MI

LOCATION.--Lat 42°27'55", long 83°48'00", in sec.24, T.1 N., R.5 E., Livingston County, Hydrologic Unit 04090005, on right bank at downstream side of bridge on Hamburg Road, 1.1 mi (1.8 km) north of Hamburg, and 3 mi (5 km) upstream from Strawberry Lake.

DRAINAGE AREA.--308 mi<sup>2</sup> (798 km<sup>2</sup>).

PERIOD OF RECORD.--October 1951 to current year.

REVISED RECORDS.--WSP 2112: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 850.00 ft (259.080 m) National Geodetic Vertical Datum of 1929 (levels by Michigan Department of Natural Resources). Prior to Aug. 12, 1953, nonrecording gage at same site and datum.

REMARKS.--Records good except those for the winter period, which are fair. Occasional regulation by Kent Lake, 11 mi (18 km) above station. Several observations of water temperature were made during the year.

AVERAGE DISCHARGE.--27 years, 208 ft<sup>3</sup>/s (5.891 m<sup>3</sup>/s), 9.17 in/yr (233 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,560 ft<sup>3</sup>/s (44.2 m<sup>3</sup>/s) May 15, 1956; maximum gage height, 8.46 ft (2.579 m) June 30, 1968; minimum discharge, 32 ft<sup>3</sup>/s (0.91 m<sup>3</sup>/s) July 2, 3, 1965; minimum gage height, 3.16 ft (0.963 m) Aug. 1-3, 1964.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 704 ft<sup>3</sup>/s (19.9 m<sup>3</sup>/s) Mar. 26, gage height, 6.09 ft (1.856 m); minimum, 51 ft<sup>3</sup>/s (1.44 m<sup>3</sup>/s) Sept. 9, 11; minimum gage height, 3.47 ft (1.058 m) Sept. 30.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SFP
1	136	148	210	180	170	150	500	189	173	145	70	70
2	146	179	231	180	170	150	455	144	168	143	67	67
3	145	166	227	180	170	150	430	125	164	142	77	65
4	141	132	233	170	160	150	411	122	159	139	86	61
5	138	124	219	170	160	140	395	128	155	134	89	59
6	148	143	221	160	160	140	409	131	152	128	86	58
7	140	191	201	160	160	140	406	134	147	122	82	55
8	138	183	210	160	160	140	391	141	149	116	79	54
9	136	164	215	160	160	140	399	163	154	109	79	52
10	133	168	210	160	160	140	407	179	152	104	80	53
11	136	172	205	160	160	140	412	187	145	96	81	51
12	144	164	200	160	160	136	406	201	140	90	79	54
13	150	181	190	160	160	139	398	235	143	86	77	59
14	150	230	190	160	160	153	358	284	139	86	74	64
15	143	224	200	160	160	187	316	322	132	85	72	69
16	130	187	210	160	170	211	305	346	128	82	74	73
17	118	178	221	150	170	219	302	358	130	78	75	81
18	112	169	235	150	160	220	296	353	129	75	76	93
19	113	160	253	150	160	239	292	339	128	71	80	102
20	116	158	269	150	160	269	298	322	127	72	85	102
21	117	213	283	150	160	322	301	320	140	71	86	101
22	118	270	282	150	150	389	296	305	147	71	84	98
23	121	257	274	150	150	477	295	286	155	70	82	92
24	124	227	262	150	150	566	251	268	160	71	79	87
25	121	198	247	150	150	672	203	251	156	69	77	80
26	122	198	230	160	150	702	200	233	158	68	76	74
27	122	189	220	180	150	686	203	218	166	71	76	70
28	120	202	210	190	150	657	202	206	166	71	76	68
29	117	225	200	190	---	635	201	194	163	71	76	67
30	112	214	190	180	---	598	198	183	153	72	74	66
31	108	---	180	170	---	559	---	178	---	71	72	---
TOTAL	4015	5614	6928	5060	4460	9616	9936	7045	4478	2879	2426	2145
MEAN	130	187	223	163	159	310	331	227	149	92.9	78.3	71.5
MAX	150	270	283	190	170	702	500	358	173	145	89	102
MIN	108	124	180	150	150	136	198	122	127	68	67	51
CFSM	.42	.61	.72	.53	.52	1.01	1.08	.74	.48	.30	.25	.23
IN.	.48	.68	.84	.61	.54	1.16	1.20	.85	.54	.35	.29	.26
CAL YR 1977	TOTAL	61596	MEAN 169	MAX 471	MIN 54	CFSM .55	IN 7.44					
WTR YR 1978	TOTAL	64602	MEAN 177	MAX 702	MIN 51	CFSM .58	IN 7.80					

## STREAMS TRIBUTARY TO LAKE ERIE

04173000 HURON RIVER NEAR DEXTER, MI

LOCATION.--Lat 42°23'10", long 83°54'40", in S<sub>4</sub> sec.13, T.1 S., R.4 E., Washtenaw County, Hydrologic Unit 04090005, at bridge on North Territorial Road, 0.5 mi (0.8 km) east of Hudson Mills, 2.0 mi (3.2 km) downstream from Portage Lake Outlet and 4.0 mi (6.4 km) north of Dexter.

DRAINAGE AREA.--522 mi<sup>2</sup> (1,352 km<sup>2</sup>).

PERIOD OF RECORD.--Water year 1971 to current year.

REMARKS.--Estimates of water discharge are based on stage-discharge relationship developed during operation of a gaging-station at this site.

COOPERATION.--Bimonthly samples were collected by the U.S. Geological Survey and were analyzed for nutrients, coliforms, and BOD by Canton Analytical Laboratory, Washtenaw County.

## WATER QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DATE	TIME	STREAM- FLOW- INSTAN- TANEOUS (CFS)	SPE- CIFIC CON- DUCT- ANCE (MICRO- MHOS)	PH (UNITS)	TEMPER- ATURE- AIR (DEG C)	TEMPER- ATURE (DEG C)	COLOR (PLAT- INUM- CORAL UNITS)	OXYGEN, DTS- SOLVED (MG/L)	OXYGEN, DTS- CENT SATUR- ATION	OXYGEN DEMAND, BIO- CHEM- ICAL, 5 DAY (MG/L)	COLI- FORM, COM- PLETE (MPN)	COLI- FORM, FECAL, EC BOTH (MPN)
NOV												
18...	1015	F320	530	8.1	2.5	6.5	--	9.8	81	.6	230	<30
JAN												
20...	1045	F178	620	8.1	-7.0	.0	--	13.6	95	2.5	230	<30
MAR												
23...	1055	F285	637	7.7	6.5	1.5	20	12.2	85	2.8	11000	<30
MAY												
25...	0930	F450	555	8.1	20.0	18.0	--	8.9	94	.8	430	<30
JUL												
07...	0955	F180	498	8.3	26.5	22.0	--	6.9	81	1.0	230	<30
SEP												
07...	1015	F42	637	8.1	24.0	21.0	--	6.4	73	.5	230	<30

DATE	HARD- NESS (MG/L AS CAC03)	HARD- NESS, NONCAR- BONATE (MG/L CAC03)	CALCIUM DTS- SOLVED (MG/L AS CA)	MAGNE- SIUM, DTS- SOLVED (MG/L AS MG)	SODIUM, DTS- SOLVED (MG/L AS NA)	POTAS- SIUM, DTS- SOLVED (MG/L AS K)	PICAR- BONATE (MG/L AS HC03)	CAR- BONATE (MG/L AS C03)	ALKA- LITY (MG/L AS CAC03)	CARBON DIOXIDE DTS- SOLVED (MG/L AS C02)	SULFATE DTS- SOLVED (MG/L AS S04)	CHLO- RIDE, DTS- SOLVED (MG/L AS CL)
NOV												
18...	--	--	--	--	--	--	230	0	189	2.9	--	--
JAN												
20...	--	--	--	--	--	--	250	0	205	3.2	--	--
MAR												
23...	280	67	75	22	24	2.1	260	0	213	8.3	50	44
MAY												
25...	--	--	--	--	--	--	230	0	189	2.9	--	--
JUL												
07...	--	--	--	--	--	--	230	0	189	1.8	--	--
SEP												
07...	240	60	58	22	24	1.7	220	0	180	2.8	48	45

E--ESTIMATED VALUE

## STREAMS TRIBUTARY TO LAKE ERIE

365

04173000 HURON RIVER NEAR DEXTER, MI--CONTINUED

## WATER-QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978--CONTINUED

DATE	FIHO- RIDE, DIS- SOLVED (MG/L AS F)	SILICA, DIS- SOLVED (MG/L AS SiO2)	SOLIDS, RESIDUE AT 180 DEG. C DIS- SOLVED (MG/L)	SOLIDS, SUM OF CONSTITUENTS, DIS- SOLVED (MG/L)	SOLIDS, DIS- SOLVED (TONS PER DAY)	NITRO- GEN, NITRATE TOTAL (MG/L AS N)	NITRO- GEN, NITRITE TOTAL (MG/L AS N)	NITRO- GEN, NO2+NO3 TOTAL (MG/L AS N)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N)	NITRO- GEN, ORGANIC TOTAL (MG/L AS N)	NITRO- GEN,AM- MONIA + ORGANIC TOTAL (MG/L AS N)
NOV 19...	--	--	--	--	--	.20	.01	.21	--	.34	--	--
JAN 20...	--	--	--	--	--	.45	.01	.46	--	.40	--	--
MAR 23...	.2	9.4	366	355	321	.47	.04	.51	.51	.30	.57	.87
MAY 25...	--	--	--	--	--	.26	.03	.29	--	1.6	--	--
JUL 07...	--	--	--	--	--	.14	.00	.14	--	.42	--	--
SEP 07...	.2	5.3	345	313	41.9	.01	.00	.01	.01	.01	.45	.46
DATE	NITRO- GEN, TOTAL (MG/L AS N)	NITRO- GEN, TOTAL (MG/L AS NO3)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, ORTHO. TOTAL (MG/L AS P)	ARSENIC DIS- SOLVED (UG/L AS AS)	CADMIUM DIS- SOLVED (UG/L AS CD)	COBALT, DIS- SOLVED (UG/L AS CO)	IRON, DIS- SOLVED (UG/L AS FE)	LEAD, DIS- SOLVED (UG/L AS PB)	MANGA- NESE, DIS- SOLVED (UG/L AS MN)	MERCURY DIS- SOLVED (UG/L AS HG)	METHY- LENE BLUE ACTIVE SUB- STANCE (MG/L)
NOV 19...	--	--	.06	.06	--	--	--	--	--	--	--	.00
JAN 20...	--	--	.01	.00	--	--	--	--	--	--	--	.00
MAR 23...	1.4	6.2	.04	.01	--	--	--	60	--	60	--	.00
MAY 25...	--	--	.01	.01	--	--	--	--	--	--	--	.00
JUL 07...	--	--	.01	.01	--	--	--	--	--	--	--	.00
SEP 07...	.47	2.1	.01	.00	2	2	2	0	2	0	<.5	.00



## STREAMS TRIBUTARY TO LAKE ERIE

04173254 MILL CREEK NEAR LIMA CENTER, MI

LOCATION.--Lat 42°16'54", long 83°55'22", in NE¼ sec.26, T.2 S., R.4 E., Washtenaw County, Hydrologic Unit 04090005, at bridge on Jerusalem Road, 0.3 mi (0.5 km) upstream from North Fork Mill Creek, 2.0 mi (3.2 km) southeast of Lima Center, 2.1 mi (3.4 km) upstream from gaging station near Dexter, and 6.2 mi (10 km) upstream from Huron River.

DRAINAGE AREA.--59.8 mi<sup>2</sup> (155 km<sup>2</sup>).

PERIOD OF RECORD.--Water years 1971 to current year.

REMARKS.--Estimates of water discharge are based on current records of streamflow at the gaging station near Dexter and records of streamflow at the partial-record station, Mill Creek near Lima Center.

COOPERATION.--Bimonthly samples were collected by the U.S. Geological Survey and were analyzed for nutrients, coliforms, and BOD by Canton Analytical Laboratory, Washtenaw County.

## WATER QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DATE	TIME	STREAM- FLOW, INSTAN- TANEOUS (CFS)	SPE- CIFIC CON- DUCT- ANCE (MICRO- MHOS)	PH (UNITS)	TEMPER- ATURE, AIR (DEG C)	TEMPER- ATURE (DEG C)	COLOR (PLAT- INUM- COBALT UNITS)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION)	OXYGEN DEMAND, BIO- CHEM- ICAL, 5 DAY (MG/L)	COLI- FORM, COM- PLETE (MPN)
NOV 18...	1155	E19	732	8.3	2.5	5.0	--	12.1	98	1.5	4600
JAN 20...	1245	E16	787	8.0	-6.0	.0	--	12.6	88	1.9	2400
MAR 23...	1350	E315	490	7.6	8.0	4.5	50	11.4	80	2.7	>240000
MAY 25...	1105	E30	812	7.8	24.0	17.0	--	9.0	95	.6	4600
JUL 07...	1130	E16	583	8.2	27.5	20.0	--	9.2	108	.7	11000
SEP 07...	1245	E11	702	8.3	28.5	20.5	--	9.4	107	.6	1500

B--ESTIMATED VALUE

DATE	COLI- FORM, FECAL, EC BROTH (MPN)	HARD- NESS (MG/L AS CAC03)	HARD- NESS, NONCAR- BONATE (MG/L CAC03)	CALCIUM DIS- SOLVED (MG/L AS CA)	MAGNE- SIUM, DIS- SOLVED (MG/L AS MG)	SODIUM, DIS- SOLVED (MG/L AS NA)	POTAS- SIUM, DIS- SOLVED (MG/L AS K)	BICAR- BONATE (MG/L AS HC03)	CAR- BONATE (MG/L AS C03)	ALKA- LINITY (MG/L AS CAC03)	CARBON DIOXIDE DIS- SOLVED (MG/L AS C02)
NOV 18...	110	--	--	--	--	--	--	350	0	287	2.8
JAN 20...	<30	--	--	--	--	--	--	330	0	271	5.3
MAR 23...	<30	240	92	72	14	5.5	3.8	180	0	148	7.2
MAY 25...	430	--	--	--	--	--	--	320	0	262	8.1
JUL 07...	930	--	--	--	--	--	--	330	0	271	3.3
SEP 07...	430	320	74	86	25	15	1.7	300	0	246	2.4

DATE	SULFATE DIS- SOLVED (MG/L AS SO4)	CHLO- RIDE, DIS- SOLVED (MG/L AS CL)	FLUO- RIDE, DIS- SOLVED (MG/L AS F)	SILICA, DIS- SOLVED (MG/L AS SiO2)	LIOS, RESIDUE AT 180 DEG. C DIS- SOLVED (MG/L)	SOLIDS, SUM OF CONSTITUENTS, DIS- SOLVED (MG/L)	NITRO- GEN, NITRATE TOTAL (MG/L AS N)	NITRO- GEN, NITRITE TOTAL (MG/L AS N)	NITRO- GEN, NO2+NO3 TOTAL (MG/L AS N)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N)
NOV 18...	--	--	--	--	--	--	.39	.01	.40	--
JAN 20...	--	--	--	--	--	--	1.6	.01	1.6	--
MAR 23...	87	16	.2	6.6	326	294	7.1	.07	7.2	7.2
MAY 25...	--	--	--	--	--	--	.03	.04	.07	--
JUL 07...	--	--	--	--	--	--	.40	.00	.40	--
SEP 07...	59	29	.3	13	401	377	.04	.00	.04	.04

## STREAMS TRIBUTARY TO LAKE ERIE

367

04173254 MILL CREEK NEAR LIMA CENTER, MI--CONTINUED

WATER-QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978--CONTINUED

DATE	NITRO- GEN, AMMONIA TOTAL (MG/L AS N)	NITRO- GEN, ORGANIC TOTAL (MG/L AS N)	NITRO- GEN, AM- MONIA + ORGANIC TOTAL (MG/L AS N)	NITRO- GEN, TOTAL (MG/L AS N)	NITRO- GEN, TOTAL (MG/L AS NO3)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, ORTHO, TOTAL (MG/L AS P)	ARSENIC DIS- SOLVED (UG/L AS AS)	CADMIUM DIS- SOLVED (UG/L AS CD)	CHRO- MIUM, DIS- SOLVED (UG/L AS CR)
NOV 18...	.16	--	--	--	--	.04	.03	--	--	--
JAN 20...	.33	--	--	--	--	.02	.01	--	--	--
MAR 23...	.23	1.4	1.6	8.8	39	.11	.05	--	--	--
MAY 25...	.95	--	--	--	--	.03	.02	--	--	--
JUL 07...	.46	--	--	--	--	.02	.01	--	--	--
SEP 07...	.03	.60	.63	.68	3.0	.02	.00	2	2	0

DATE	COBALT, DIS- SOLVED (UG/L AS CO)	COPPER, DIS- SOLVED (UG/L AS CU)	IRON, DIS- SOLVED (UG/L AS FE)	LEAD, DIS- SOLVED (UG/L AS PB)	MANGA- NESE, DIS- SOLVED (UG/L AS MN)	MERCURY DIS- SOLVED (UG/L AS HG)	NICKEL, DIS- SOLVED (UG/L AS NI)	SELE- NIUM, DIS- SOLVED (UG/L AS SE)	ZINC, DIS- SOLVED (UG/L AS ZN)	METHY- LENE BLUE ACTIVE SUB- STANCE (MG/L)
NOV 18...	--	--	--	--	--	--	--	--	--	.00
JAN 20...	--	--	--	--	--	--	--	--	--	.00
MAR 23...	--	--	150	--	60	--	--	--	--	.00
MAY 25...	--	--	--	--	--	--	--	--	--	.00
JUL 07...	--	--	--	--	--	--	--	--	--	.00
SEP 07...	2	0	0	1	30	<.5	0	0	0	.00

## STREAMS TRIBUTARY TO LAKE ERIE

04173310 NORTH FORK MILL CREEK NEAR CHELSEA, MI

LOCATION.--Lat 42°19'34", long 84°00'57", in SE¼ sec.1, T.2 S., R.3 E., Washtenaw County, Hydrologic Unit 04090005, at bridge on McKinley Road, 0.4 mi (0.6 km) upstream from Letts Creek, 0.5 mi (0.8 km) north of Chelsea, and 6.6 mi (10.6 km) upstream from Mill Creek.

DRAINAGE AREA.--14.6 mi<sup>2</sup> (37.8 km<sup>2</sup>).

PERIOD OF RECORD.--Water years 1971 to current year.

COOPERATION.--Bimonthly samples were collected by the U.S. Geological Survey and were analyzed for nutrients, coliforms, and BOD by Canton Analytical Laboratory, Washtenaw County.

## WATER QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DATE	TIME	STREAM STAGE (FT ABOVE DATUM)	SPE- CIFIC CON- DUCT- ANCE (MICRO- MHOS)	PH (UNITS)	TEMPER- ATURE, AIR (DEG C)	TEMPER- ATURE (DEG C)	COLOR (PLAT- INUM- COBALT UNITS)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION)	OXYGEN DEMAND, BIO- CHEM- ICAL, 5 DAY (MG/L)	COLI- FORM, COM- PLETE (MPN)	COLI- FORM, FECAL, EC BROTH (MPN)
NOV 18...	1215	40.59	529	8.1	2.5	4.0	--	11.7	93	.8	2400	70
JAN 20...	1200	40.50	528	8.0	-7.0	.0	--	14.1	99	2.0	2400	40
MAR 23...	1225	41.99	390	7.9	6.0	3.5	40	12.2	85	1.8	4600	<30
MAY 25...	1025	40.82	476	7.9	22.0	15.0	--	8.6	91	.5	4600	430
JUL 07...	1050	40.39	435	8.0	26.0	22.0	--	8.4	99	.7	11000	430
SEP 07...	1125	40.11	627	8.2	24.5	19.0	--	8.6	98	1.6	1500	430

DATE	HARD- NESS (MG/L AS CAC03)	HARD- NESS, NONCAR- BONATE (MG/L CAC03)	CALCIUM DIS- SOLVED (MG/L AS CA)	MAGNE- SIUM, DIS- SOLVED (MG/L AS MG)	SODIUM, DIS- SOLVED (MG/L AS NA)	POTAS- SIUM, DIS- SOLVED (MG/L AS K)	BICAR- BONATE (MG/L AS HC03)	CAR- BONATE (MG/L AS C03)	ALKA- LINITY (MG/L AS CAC03)	CARBON DIOXIDE DIS- SOLVED (MG/L AS C02)	SULFATE DIS- SOLVED (MG/L AS S04)	CHLO- RIDE, DIS- SOLVED (MG/L AS CL)
NOV 18...	--	--	--	--	--	--	270	0	221	3.4	--	--
JAN 20...	--	--	--	--	--	--	270	0	221	4.3	--	--
MAR 23...	200	44	56	14	6.3	1.6	190	0	156	3.8	32	14
MAY 25...	--	--	--	--	--	--	240	0	197	4.8	--	--
JUL 07...	--	--	--	--	--	--	260	0	213	4.2	--	--
SEP 07...	290	60	80	21	12	1.4	280	0	230	2.8	45	25

STREAMS TRIBUTARY TO LAKE ERIE

369

04173310 NORTH FORK MILL CREEK NEAR CHELSEA, MI--CONTINUED

WATER-QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978--CONTINUED

DATE	FLUO- RIDE, DIS- SOLVED (MG/L AS F)	SILICA, DIS- SOLVED (MG/L AS SI02)	SOLIDS, RESIDUE AT 180 DEG. C DIS- SOLVED (MG/L)	SOLIDS, SUM OF CONSTI- TUENTS, DIS- SOLVED (MG/L)	NITRO- GEN, NITRATE TOTAL (MG/L AS N)	NITRO- GEN, NITRITE TOTAL (MG/L AS N)	NITRO- GEN, NO2+NO3 TOTAL (MG/L AS N)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N)	NITRO- GEN, ORGANIC TOTAL (MG/L AS N)	NITRO- GEN+AM- MONIA + ORGANIC TOTAL (MG/L AS N)	NITRO- GEN, TOTAL (MG/L AS N)
NOV 18...	--	--	--	--	.20	.00	.20	--	.22	--	--	--
JAN 20...	--	--	--	--	.42	.01	.43	--	.35	--	--	--
MAR 23...	.1	9.2	247	227	.62	.02	.64	.64	.08	1.0	1.1	1.7
MAY 25...	--	--	--	--	.52	.06	.58	--	1.1	--	--	--
JUL 07...	--	--	--	--	.40	.00	.40	--	.62	--	--	--
SEP 07...	.2	13	411	336	.16	.01	.17	.17	.02	.18	.20	.36

DATE	NITRO- GEN, TOTAL (MG/L AS NO3)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, ORTHO. TOTAL (MG/L AS P)	ARSENIC DIS- SOLVED (UG/L AS AS)	CADMIUM DIS- SOLVED (UG/L AS CD)	COBALT, DIS- SOLVED (UG/L AS CO)	IRON, DIS- SOLVED (UG/L AS FE)	LEAD, DIS- SOLVED (UG/L AS PB)	MANGA- NESE, DIS- SOLVED (UG/L AS MN)	MERCURY DIS- SOLVED (UG/L AS HG)	METHY- LENE BLUE ACTIVE SUB- STANCE (MG/L)
NOV 18...	--	.02	.02	--	--	--	--	--	--	--	.00
JAN 20...	--	.01	.00	--	--	--	--	--	--	--	.00
MAR 23...	7.5	.02	.01	--	--	--	140	--	30	--	.00
MAY 25...	--	.06	.01	--	--	--	--	--	--	--	.00
JUL 07...	--	.05	.01	--	--	--	--	--	--	--	.00
SEP 07...	1.6	.01	.00	1	2	2	10	0	30	<.5	.00

## STREAMS TRIBUTARY TO LAKE ERIE

04173350 NORTH FORK MILL CREEK NEAR LIMA CENTER, MI

LOCATION.--Lat 42°17'46", long 83°57'33", in SW¼ sec.23, T.2 S., R.4 E., Washtenaw County, Hydrologic Unit 04090005, at bridge on Dancer Road, 1.2 mi (1.9 km) southeast of Lima Center, 5.1 mi (8.2 km) downstream from Letts Creek, and 1.1 mi (1.8 km) upstream from Mill Creek.

DRAINAGE AREA.--59.0 mi<sup>2</sup> (153 km<sup>2</sup>).

PERIOD OF RECORD.--Water years 1971 to current year.

REMARKS.--Estimates of water discharge based on previous streamflow partial-record data and correlation with station 04173500.

COOPERATION.--Bimonthly samples were collected by the U.S. Geological Survey and were analyzed for nutrients, coliforms, and BOD by Canton Analytical Laboratory, Washtenaw County.

## WATER QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DATE	TIME	STREAM- FLOW, INSTAN- TANEOUS (CFS)	SPE- CIFIC CON- DUCT- ANCE (MICRO- MHOS)	PH (UNITS)	TEMPER- ATURE, AIR (DEG C)	TEMPER- ATURE (DEG C)	COLOR (PLAT- INUM- COBALT UNITS)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION)	OXYGEN DEMAND, BIO- CHEM- ICAL, 5 DAY (MG/L)	COLI- FORM, COM- PLETE (MPN)	COLI- FORM, FECAL, EC BROTH (MPN)
NOV 18...	1255	E20	712	7.9	2.5	5.0	--	11.0	89	2.0	4600	390
JAN 20...	1315	E12	749	7.9	-6.5	.0	--	12.6	88	3.3	930	<30
MAR 23...	1510	E280	473	7.7	6.0	4.0	40	11.4	80	2.3	>240000	40
MAY 25...	1145	E36	774	7.8	24.5	16.5	--	8.3	87	1.3	2400	90
JUL 07...	1155	E9.0	666	8.2	27.0	20.0	--	9.7	114	.9	11000	230
SEP 07...	1350	E10	926	8.1	29.5	22.0	--	11.6	132	1.3	11000	430

E--ESTIMATED VALUE

DATE	HARD- NESS (MG/L AS CAC03)	HARD- NESS, NONCAR- BONATE (MG/L CAC03)	CALCIUM DIS- SOLVED (MG/L AS CA)	MAGNE- SIUM, DIS- SOLVED (MG/L AS MG)	SODIUM, DIS- SOLVED (MG/L AS NA)	POTAS- SIUM, DIS- SOLVED (MG/L AS K)	BICAR- BONATE (MG/L AS HC03)	CAR- BONATE (MG/L AS C03)	ALKA- LITY (MG/L AS CAC03)	CARBON DIOXIDE DIS- SOLVED (MG/L AS C02)	SULFATE DIS- SOLVED (MG/L AS S04)	CHLO- RIDE, DIS- SOLVED (MG/L AS CL)
NOV 18...	--	--	--	--	--	--	320	0	262	6.4	--	--
JAN 20...	--	--	--	--	--	--	320	0	262	6.4	--	--
MAR 23...	210	62	61	14	11	2.7	180	0	148	5.7	50	24
MAY 25...	--	--	--	--	--	--	300	0	246	7.6	--	--
JUL 07...	--	--	--	--	--	--	320	0	262	3.2	--	--
SEP 07...	350	100	97	26	41	2.8	300	0	246	3.8	77	77



## STREAMS TRIBUTARY TO LAKE ERIE

371

04173350 NORTH FORK MILL CREEK NEAR LIMA CENTER, MI--CONTINUED

WATER-QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978--CONTINUED

DATE	FLUORIDE, DIS- SOLVED (MG/L AS F)	SILICA, DIS- SOLVED (MG/L AS SiO2)	SOLIDS, RESIDUE AT 180 DEG. C DIS- SOLVED (MG/L)	SOLIDS, SUM OF CONSTITUENTS, DIS- SOLVED (MG/L)	NITRO- GEN, NITRATE TOTAL (MG/L AS N)	NITRO- GEN, NITRITE TOTAL (MG/L AS N)	NITRO- GEN, NO2+NO3 TOTAL (MG/L AS N)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N)	NITRO- GEN, ORGANIC TOTAL (MG/L AS N)	NITRO- GEN+AM- MONIA + ORGANIC TOTAL (MG/L AS N)	NITRO- GEN, TOTAL (MG/L AS N)
NOV 18...	--	--	--	--	.64	.02	.66	--	.38	--	--	--
JAN 20...	--	--	--	--	.56	.01	.57	--	.82	--	--	--
MAR 23...	.1	8.3	295	260	1.9	.07	2.0	2.0	.17	1.1	1.3	3.4
MAY 25...	--	--	--	--	.14	.01	.15	--	.83	--	--	--
JUL 07...	--	--	--	--	1.1	.04	1.1	--	.45	--	--	--
SEP 07...	.3	12	574	488	1.5	.05	1.5	1.5	.03	.54	.57	2.1

DATE	NITRO- GEN, TOTAL (MG/L AS NO3)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, ORTHO. TOTAL (MG/L AS P)	ARSENIC DIS- SOLVED (UG/L AS AS)	CADMIUM DIS- SOLVED (UG/L AS CD)	COBALT, DIS- SOLVED (UG/L AS CO)	IRON, DIS- SOLVED (UG/L AS FE)	LEAD, DIS- SOLVED (UG/L AS PB)	MANGA- NESE, DIS- SOLVED (UG/L AS MN)	MERCURY DIS- SOLVED (UG/L AS HG)	METHY- LENE BLUE ACTIVE SUB- STANCE (MG/L)
NOV 18...	--	.06	.04	--	--	--	--	--	--	--	.00
JAN 20...	--	.08	.03	--	--	--	--	--	--	--	.00
MAR 23...	15	.09	.03	--	--	--	120	--	60	--	.00
MAY 25...	--	.02	.01	--	--	--	--	--	--	--	.00
JUL 07...	--	.07	.04	--	--	--	--	--	--	--	.00
SEP 07...	9.3	.05	.02	1	2	2	20	1	50	<.5	.00

## STREAMS TRIBUTARY TO LAKE ERIE

04173500 MILL CREEK NEAR DEXTER, MI

LOCATION.--Lat 42°18'00", long 83°53'55", in SW<sub>4</sub> sec.18, T.2 S., R.5 E., Washtenaw County, Hydrologic Unit 04090005, on left bank 12 ft (4 m) downstream from bridge on Parker Road, 2.5 mi (4.0 km) south of Dexter, and 4 mi (6 km) upstream from mouth.

DRAINAGE AREA.--128 mi<sup>2</sup> (332 km<sup>2</sup>).

PERIOD OF RECORD.--February 1952 to current year.

REVISED RECORDS.--WSP 2112: Drainage area.

GAGE.--Water-stage recorder. Altitude of gage is 850 ft (259 m) from topographic map (nearest 10 ft). Prior to May 23, 1958, non-recording gage at same site and datum.

REMARKS.--Records good except those for the winter period, which are fair. Several observations of water temperature were made during the year.

AVERAGE DISCHARGE.--26 years, 78.1 ft<sup>3</sup>/s (2.212 m<sup>3</sup>/s), 8.29 in/yr (211 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,500 ft<sup>3</sup>/s (42.5 m<sup>3</sup>/s) June 26, 1968, gage height, 12.95 ft (3.947 m); minimum, 7.3 ft<sup>3</sup>/s (0.21 m<sup>3</sup>/s) Dec. 13, 1963; minimum gage height, 4.94 ft (1.506 m) Dec. 13, 1963, Feb. 22, 1964.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 835 ft<sup>3</sup>/s (23.6 m<sup>3</sup>/s) Mar. 22, gage height, 11.37 ft (3.466 m), only peak above base of 500 ft<sup>3</sup>/s (14.2 m<sup>3</sup>/s); minimum, 16 ft<sup>3</sup>/s (0.45 m<sup>3</sup>/s) Sept. 29, 30; minimum gage height, 5.34 ft (1.628 m) Aug. 24, 25.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	51	32	90	50	41	39	384	67	47	33	22	18
2	67	35	64	49	41	39	312	64	47	39	21	18
3	52	36	54	48	40	39	274	61	44	46	21	17
4	43	31	68	47	40	39	293	57	40	42	20	17
5	38	31	91	46	40	39	336	61	39	38	20	17
6	34	32	76	45	40	39	302	71	36	35	20	17
7	30	37	64	45	40	39	333	68	37	32	21	17
8	38	45	31	44	40	39	250	73	41	30	21	17
9	45	46	34	43	40	39	197	103	39	29	20	17
10	39	62	37	43	40	40	181	90	35	28	20	17
11	36	59	37	43	40	42	204	80	33	26	21	17
12	41	49	38	42	40	46	180	104	34	26	21	18
13	45	41	46	42	40	56	151	210	40	26	20	21
14	30	37	108	42	40	96	131	420	36	25	20	23
15	29	39	149	42	40	168	114	366	33	25	19	27
16	35	51	147	42	39	181	103	288	33	24	24	22
17	31	59	160	42	39	186	96	217	35	23	23	27
18	32	52	236	42	39	179	95	167	33	23	21	28
19	31	49	284	42	39	162	115	137	31	22	21	24
20	35	78	269	42	39	244	156	126	30	22	20	21
21	26	68	248	42	39	584	170	188	68	26	20	20
22	25	53	185	42	39	811	143	145	55	27	19	19
23	30	54	149	41	39	729	120	115	42	25	19	18
24	29	50	128	41	39	634	114	101	37	23	19	18
25	27	48	152	41	39	435	105	89	34	22	19	17
26	27	47	166	41	39	311	93	79	47	22	19	17
27	28	42	100	41	39	324	84	69	63	21	19	17
28	29	74	66	41	39	317	77	61	49	21	18	17
29	27	184	56	41	---	364	72	55	40	23	18	16
30	27	138	53	41	---	274	70	52	35	23	18	16
31	27	---	50	41	---	303	---	50	---	22	18	---
TOTAL	1084	1659	3436	1334	1109	6837	5255	3834	1213	849	622	575
MEAN	35.0	55.3	111	43.0	39.6	221	175	124	40.4	27.4	20.1	19.2
MAX	67	184	284	50	41	811	384	420	68	46	24	28
MTN.	25	31	31	41	39	39	70	50	30	21	18	16
CFSM	.27	.43	.87	.34	.31	1.73	1.37	.97	.32	.21	.16	.15
IN.	.32	.48	1.00	.39	.32	1.99	1.53	1.11	.35	.25	.18	.17

CAL YR 1977 TOTAL 24752 MEAN 67.8 MAX 575 MIN 18 CFSM .53 IN 7.19  
WTR YR 1978 TOTAL 27807 MEAN 76.2 MAX 811 MIN 16 CFSM .60 IN 8.08

STREAMS TRIBUTARY TO LAKE ERIE

373

04174050 HURON RIVER AT DELHI MILLS, MI

LOCATION.--Lat 42°20'01", long 83°48'34", in SE¼ sec.2, T.2 S., R.5 E., Washtenaw County, Hydrologic Unit 04090005, at bridge on Delhi Road, 5.0 mi (8.0 km) northwest of Ann Arbor, 5.2 mi (8.4 km) downstream from Mill Creek, 5.1 mi (8.2 km) upstream from Barton Dam, and 60.0 mi (96.5 km) upstream from mouth.

DRAINAGE AREA.--699 mi² (1,810 km²).

PERIOD OF RECORD.--Water years 1971 to current year.

COOPERATION.--Bimonthly samples were collected by the U.S. Geological Survey and were analyzed for nutrients, coliforms, and BOD by Canton Analytical Laboratory, Washtenaw County.

WATER QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DATE	TIME	STREAM STAGE (FT ABOVE DATUM)	SPE- CIFIC CON- DUCT- ANCE (MICRO- MHOS)	PH (UNITS)	TEMPER- ATURE, AIR (DEG C)	TEMPER- ATURE (DEG C)	COLOR (PLAT- INUM- COBALT UNITS)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION)	OXYGEN DEMAND, BIO- CHEM- ICAL, 5 DAY (MG/L)	COLI- FORM, COM- PLETE (MPN)	COLI- FORM, FECAL, EC BROTH (MPN)
NOV 18...	0915	15.45	557	8.1	2.5	6.0	--	10.6	87	1.1	390	40
JAN 20...	0945	15.47	659	8.1	-6.5	.0	--	13.9	97	--	--	--
JAN 24...	1150	15.40	555	8.0	-3.5	.0	--	13.2	93	1.2	390	40
MAR 23...	0845	13.54	528	8.0	1.5	.0	40	12.8	90	2.6	>240000	40
MAY 25...	0815	15.10	561	7.9	15.0	17.5	--	7.7	81	1.1	24000	90
JUL 07...	0855	15.11	578	8.1	23.0	22.5	--	6.4	75	1.0	46000	750
SEP 07...	0830	15.75	660	8.0	20.0	20.5	--	5.3	60	1.2	4600	230

DATE	HARD- NESS (MG/L AS CAC03)	HARD- NESS, NONCAR- BONATE (MG/L CAC03)	CALCIUM DIS- SOLVED (MG/L AS CA)	MAGNE- SIUM, DIS- SOLVED (MG/L AS MG)	SODIUM, DIS- SOLVED (MG/L AS NA)	POTAS- SIUM, DIS- SOLVED (MG/L AS K)	BICAR- BONATE (MG/L AS HC03)	CAR- BONATE (MG/L AS C03)	ALKA- LINITY (MG/L AS CAC03)	CARBON DIOXIDE DIS- SOLVED (MG/L AS C02)	SULFATE DIS- SOLVED (MG/L AS S04)	CHLO- RIDE, DIS- SOLVED (MG/L AS CL)
NOV 18...	--	--	--	--	--	--	250	0	205	3.2	--	--
JAN 20...	--	--	--	--	--	--	270	0	221	3.4	--	--
JAN 24...	--	--	--	--	--	--	280	0	230	4.5	--	--
MAR 23...	230	74	65	16	13	3.0	190	0	156	3.0	56	28
MAY 25...	--	--	--	--	--	--	240	0	197	4.8	--	--
JUL 07...	--	--	--	--	--	--	250	0	205	3.2	--	--
SEP 07...	260	65	67	23	24	2.0	240	0	197	3.8	53	46

STREAMS TRIBUTARY TO LAKE ERIE  
04174050 HURON RIVER AT DELHI MILLS, MI--CONTINUED

WATER-QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978--CONTINUED

DATE	SILICA, DIS- SOLVED (MG/L AS SiO2)	SOLIDS, RESIDUE AT 180 DEG. C DIS- SOLVED (MG/L)	SOLIDS, SUM OF CONSTITUENTS, DIS- SOLVED (MG/L)	NITRO- GEN, NITRATE TOTAL (MG/L AS N)	NITRO- GEN, NITRITE TOTAL (MG/L AS N)	NITRO- GEN, NO2+NO3 TOTAL (MG/L AS N)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N)	NITRO- GEN, ORGANIC TOTAL (MG/L AS N)	NITRO- GEN,AM- MONIA + ORGANIC TOTAL (MG/L AS N)	NITRO- GEN, TOTAL (MG/L AS N)	NITRO- GEN, TOTAL (MG/L AS NO3)
NOV 18...	--	--	--	.26	.01	.27	--	.28	--	--	--	--
JAN 20...	--	--	--	--	--	--	--	--	--	--	--	--
JAN 24...	--	--	--	.52	.01	.53	--	.44	--	--	--	--
MAR 23...	7.5	309	283	2.9	.08	3.0	3.0	.20	1.4	1.6	4.5	20
MAY 25...	--	--	--	.33	.03	.36	--	.96	--	--	--	--
JUL 07...	--	--	--	.40	.01	.41	--	.64	--	--	--	--
SEP 07...	6.1	389	340	.11	.01	.12	.12	.04	.54	.58	.70	3.1

DATE	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, ORTHO, TOTAL (MG/L AS P)	ARSENIC DIS- SOLVED (UG/L AS AS)	CADMIUM DIS- SOLVED (UG/L AS CD)	CHRO- MIUM, DIS- SOLVED (UG/L AS CR)	COBALT, DIS- SOLVED (UG/L AS CO)	COPPER, DIS- SOLVED (UG/L AS CU)	IRON, DIS- SOLVED (UG/L AS FE)	LEAD, DIS- SOLVED (UG/L AS PB)	MANGA- NESE, DIS- SOLVED (UG/L AS MN)	MERCURY DIS- SOLVED (UG/L AS HG)
NOV 18...	.03	.01	--	--	--	--	--	--	--	--	--
JAN 20...	--	--	--	--	--	--	--	--	--	--	--
JAN 24...	.03	.02	--	--	--	--	--	--	--	--	--
MAR 23...	.08	.03	--	--	--	--	--	100	--	50	--
MAY 25...	.01	.01	--	--	--	--	--	--	--	--	--
JUL 07...	.07	.02	--	--	--	--	--	--	--	--	--
SEP 07...	.03	.01	1	2	0	2	2	20	1	20	<.5

DATE	NICKEL, DIS- SOLVED (UG/L AS NI)	SELE- NIUM, DIS- SOLVED (UG/L AS SE)	ZINC, DIS- SOLVED (UG/L AS ZN)	CARBON, ORGANIC TOTAL (MG/L AS C)	METHY- LENE BLUE ACTIVE SUB- STANCE (MG/L)	NAPH- THA- LENES, POLY- CHLOR. TOTAL (UG/L)	PCB, TOTAL (UG/L)	ALDRIN, TOTAL (UG/L)	CHLOR- DANE, TOTAL (UG/L)	DDD, TOTAL (UG/L)	DDE, TOTAL (UG/L)
NOV 18...	--	--	--	10	.00	.00	.0	.00	.0	.00	.00
JAN 20...	--	--	--	6.6	--	.00	.0	.00	.0	.00	.00
JAN 24...	--	--	--	--	.00	--	--	--	--	--	--
MAR 23...	--	--	--	9.6	.00	.00	.0	.00	.0	.00	.00
MAY 25...	--	--	--	5.8	.00	.00	.0	.00	.0	.00	.00
JUL 07...	--	--	--	14	.00	.00	.0	.00	.0	.00	.00
SEP 07...	1	0	0	7.5	.00	--	--	--	--	--	--

## STREAMS TRIBUTARY TO LAKE ERIE

375

04174050 HURON RIVER AT DFLHI MILLS, MI--CONTINUED

WATER-QUALITY DATA. WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978--CONTINUED

DATE	DDT, TOTAL (UG/L)	DI- AZINON, TOTAL (UG/L)	DI- ELDRIN TOTAL (UG/L)	ENDRIN, TOTAL (UG/L)	ETHION, TOTAL (UG/L)	HEPTA- CHLOR, TOTAL (UG/L)	HEPTA- CHLOR EPOXIDE TOTAL (UG/L)	LINDANE TOTAL (UG/L)	MALA- THION, TOTAL (UG/L)
NOV 18...	.00	.00	.00	.00	.00	.00	.00	.00	.00
JAN 20...	.00	.00	.00	.00	.00	.00	.00	.00	.00
MAR 23...	.00	.00	.00	.00	.00	.00	.00	.00	.00
MAY 25...	.00	.00	.00	.00	.00	.00	.00	.00	.00
JUL 07...	.00	.00	.00	.00	.00	.00	.00	.00	.00
SEP 07...	--	--	--	--	--	--	--	--	--

DATE	METHYL PARA- THION, TOTAL (UG/L)	METHYL TRI- THION, TOTAL (UG/L)	PARA- THION, TOTAL (UG/L)	TOX- APHENE, TOTAL (UG/L)	TOTAL TRI- THION (UG/L)	2,4-D, TOTAL (UG/L)	2,4,5-T TOTAL (UG/L)	SILVEX, TOTAL (UG/L)
NOV 18...	.00	.00	.00	0	.00	.00	.00	.00
JAN 20...	.00	.00	.00	0	.00	.04	.00	.02
MAR 23...	.00	.00	.00	0	.00	.00	.01	.00
MAY 25...	.00	.00	.00	0	.00	.09	.00	.00
JUL 07...	.00	.00	.00	0	.00	.38	.00	.00
SEP 07...	--	--	--	--	--	.05	.00	.00



## STREAMS TRIBUTARY TO LAKE ERIE

04174500 HURON RIVER AT ANN ARBOR, MI

LOCATION.--Lat 42°17'10", long 83°44'00", in NW¼ sec.28, T.2 S., R.6 E., Washtenaw County, Hydrologic Unit 04090005, on left bank 100 ft (30 m) upstream from bridge on Wall Street in Ann Arbor, 0.7 mi (1.1 km) downstream from Argo Dam, and 4.2 mi (6.8 km) upstream from Geddes Dam.

DRAINAGE AREA.--729 mi<sup>2</sup> (1,888 km<sup>2</sup>).

PERIOD OF RECORD.--February 1904 to current year. Monthly discharge only for some periods published in WSP 1307. Published as "at Geddes" February 1904 to December 1914 and as "at Barton" January 1914 to September 1940.

REVISED RECORDS.--WSP 874: 1938. WSP 2112: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 744.81 ft (227.018 m) National Geodetic Vertical Datum of 1929 (levels by Michigan Department of Natural Resources). February 1904 to December 1914 at Geddes Dam, 4.2 mi (6.8 km) downstream, and January 1914 to September 1947, at Barton Dam, 2.6 mi (4.2 km) upstream, flow computed from records of operation of powerplants and records of depth of flow over dam and/or flow through undersluices.

REMARKS.--Records good except those for period of no gage-height record, June 10 to July 13, which are fair. Diversion above station for Ann Arbor municipal supply had negligible effect on natural flow prior to 1955, figures of runoff adjusted since. Flow regulated by powerplants prior to May 1962, and since by occasional lake level control operations above station. Several observations of water temperature were made during the year.

AVERAGE DISCHARGE.--74 years, 452 ft<sup>3</sup>/s (12.80 m<sup>3</sup>/s), 8.42 in/yr (214 mm/yr), adjusted for diversion since 1955.

EXTREMES FOR PERIOD OF RECORD.--Maximum daily discharge, 5,840 ft<sup>3</sup>/s (165 m<sup>3</sup>/s) Mar. 14, 1918; minimum daily, 4 ft<sup>3</sup>/s (0.11 m<sup>3</sup>/s) Aug. 2, Sept. 11, 1931 (plant leakage), but may be doubtful due to change in leakage.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 2,630 ft<sup>3</sup>/s (74.5 m<sup>3</sup>/s) Mar. 24, gage height, 15.43 ft (4.703 m); minimum daily discharge, 40 ft<sup>3</sup>/s (1.13 m<sup>3</sup>/s) Sept. 4.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	284	193	480	438	315	296	1600	281	365	260	115	43
2	370	254	554	412	322	297	1630	357	308	330	95	64
3	430	190	511	393	361	293	1420	233	314	230	104	48
4	360	221	475	395	350	283	1200	345	328	230	125	40
5	208	323	461	390	335	303	1450	344	207	210	123	42
6	170	272	426	386	355	274	1460	515	211	200	116	43
7	141	378	409	381	350	284	1450	296	236	200	125	43
8	162	315	364	390	342	366	1300	408	345	180	132	43
9	162	364	364	335	317	371	1200	472	356	190	121	64
10	199	352	287	292	320	333	1020	403	292	160	106	50
11	196	386	318	318	318	197	1250	427	270	150	105	45
12	304	360	333	313	302	216	1220	530	240	140	117	57
13	181	327	359	336	305	256	1050	773	220	150	107	69
14	285	323	432	349	310	361	866	1120	190	134	115	115
15	248	370	464	338	300	441	799	1140	210	112	63	112
16	193	446	470	318	301	549	791	1100	220	107	140	146
17	242	471	498	329	372	613	826	971	230	81	110	206
18	147	399	608	312	357	663	723	832	200	109	90	182
19	110	349	764	290	329	658	630	860	200	93	100	153
20	120	328	763	296	317	694	572	800	190	97	85	162
21	253	338	761	288	321	1200	1040	963	500	142	82	161
22	264	344	696	310	301	1600	642	634	280	119	87	224
23	221	365	666	308	302	1880	671	699	270	121	84	145
24	160	377	629	276	256	2300	823	603	230	118	80	104
25	150	403	607	288	276	1780	697	618	230	113	78	147
26	174	389	502	274	264	1890	663	701	400	121	87	97
27	238	393	500	269	267	1550	515	454	360	115	107	152
28	246	376	444	293	288	1720	456	433	290	82	88	109
29	173	363	460	292	---	1770	537	399	260	135	72	147
30	233	362	455	302	---	1660	489	394	240	125	47	97
31	168	---	448	319	---	1610	---	337	---	83	43	---
TOTAL	6792	10331	15508	10230	8853	26708	28990	18442	8192	4627	3049	3110
MEAN	219	344	500	330	316	862	966	595	273	149	98.4	104
MAX	430	471	764	438	372	2300	1630	1140	500	330	140	224
MIN	110	190	287	269	256	197	456	233	190	81	43	40
MEAN+	239	363	516	346	334	879	984	616	297	177	129	131
CFSM+	.33	.50	.71	.47	.46	1.21	1.35	.84	.41	.24	.18	.18
IN+	.38	.55	.82	.55	.48	1.39	1.51	.97	.45	.28	.20	.20

CAL YR 1977 TOTAL 128868 MEAN 353 MAX 1390 MIN 64 MEAN+ 374 CFSM+ .51 IN+ 6.96

WTR YR 1978 TOTAL 144832 MEAN 397 MAX 2300 MIN 40 MEAN+ 418 CFSM+ .57 IN+ 7.78

\*Adjusted for diversion for municipal supply; record furnished by City of Ann Arbor.

## STREAMS TRIBUTARY TO LAKE ERIE

377

04174800 HURON RIVER AT YPSILANTI, MI

LOCATION.--Lat 42°14'57", long 83°36'45", in SW¼ sec.4, T.3 S., R.7 E., Washtenaw County, Hydrologic Unit 04090005, on left bank 30 ft (9 m) downstream from bridge on Forest Avenue in Ypsilanti, 4.9 mi (7.9 km) downstream from Geddes Dam and 5.6 mi (9.0 km) upstream from Ford Dam, and at mile 42.8 (68.9 km).

DRAINAGE AREA.--807 mi<sup>2</sup> (2,090 km<sup>2</sup>).

## WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--June 1974 to current year.

GAGE.--Water-stage recorder. Altitude of gage is 700 ft (213 m) from topographic map (nearest 5 ft).

REMARKS.--Water-discharge records good. Considerable regulation caused by many dams above station; storage capacity is small.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 4,300 ft<sup>3</sup>/s (122 m<sup>3</sup>/s) Mar. 5, 1976, gage height, 12.50 ft (3.810 m); minimum, 14 ft<sup>3</sup>/s (0.40 m<sup>3</sup>/s) June 15, 1976, gage height, 6.45 ft (1.966 m); minimum daily, 64 ft<sup>3</sup>/s (1.81 m<sup>3</sup>/s) Sept. 4, 1978.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 2,620 ft<sup>3</sup>/s (74.2 m<sup>3</sup>/s) Mar. 24, gage height, 11.18 ft (3.408 m); minimum 60 ft<sup>3</sup>/s (1.70 m<sup>3</sup>/s) Oct. 14, gage height, 6.87 ft (2.094 m); minimum daily, 64 ft<sup>3</sup>/s (1.81 m<sup>3</sup>/s) Sept. 4.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	330	213	734	525	380	331	1620	367	423	352	137	67
2	390	363	685	475	430	305	1580	423	410	478	150	101
3	470	260	605	412	385	338	1430	305	294	321	182	72
4	400	272	569	431	367	309	1290	387	394	332	172	64
5	280	328	538	427	371	313	1480	361	276	305	140	66
6	215	331	500	444	367	324	1550	662	253	294	166	67
7	203	447	479	446	385	327	1500	335	324	312	167	67
8	246	374	455	447	367	407	1320	444	351	271	198	67
9	229	431	428	378	371	393	1200	584	487	285	165	102
10	266	497	354	380	371	420	1160	445	320	244	160	73
11	198	460	391	440	354	309	1470	466	337	237	134	70
12	302	425	412	376	359	291	1370	655	369	229	181	184
13	150	400	443	380	350	338	1150	917	320	243	136	204
14	331	382	646	393	338	637	986	1250	253	226	136	200
15	282	427	621	359	335	713	882	1310	297	202	100	172
16	302	530	621	367	359	802	871	1160	288	162	220	200
17	292	535	625	359	398	819	906	1080	325	185	166	277
18	196	482	839	346	398	865	830	966	266	161	143	254
19	215	416	902	376	363	865	819	967	273	182	165	200
20	171	416	957	359	350	952	802	872	257	155	131	176
21	298	407	900	359	346	1880	1220	1040	680	210	128	181
22	290	400	824	338	342	2020	808	753	384	261	138	249
23	310	428	764	342	338	2020	718	719	367	195	134	135
24	235	447	742	354	320	2380	946	708	304	190	125	159
25	180	471	741	363	313	1910	752	654	315	170	124	150
26	247	447	660	416	309	1870	762	807	555	190	137	171
27	283	454	564	338	316	1550	595	495	481	179	171	155
28	291	440	508	367	316	1670	512	485	385	144	134	170
29	247	412	519	354	---	1730	579	504	363	191	116	131
30	287	433	535	363	---	1620	564	476	335	166	73	169
31	226	---	518	371	---	1650	---	383	---	183	68	---
TOTAL	8362	12328	19079	12085	9998	30358	31672	20980	10686	7255	4497	4353
MEAN	270	411	615	390	357	979	1056	677	356	234	145	145
MAX	470	535	957	525	430	2380	1620	1310	680	478	220	277
MIN	150	213	354	338	309	291	512	305	253	144	68	64
CFSM	.34	.51	.76	.48	.44	1.21	1.31	.84	.44	.29	.18	.18
IN.	.39	.57	.88	.56	.46	1.40	1.46	.97	.49	.33	.21	.20

CAL YR 1977 TOTAL 165179 MEAN 453 MAX 1650 MIN 116 CFSM .56 IN 7.61  
WTR YR 1978 TOTAL 171653 MEAN 470 MAX 2380 MIN 64 CFSM .58 IN 7.91

## STREAMS TRIBUTARY TO LAKE ERIE

04174800 HURON RIVER AT YPSILANTI--CONTINUED

## WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1971 to current year.

COOPERATION.--Bimonthly samples were collected by the U.S. Geological Survey and were analyzed for nutrients, coliforms, and BOD by Canton Analytical Laboratory, Washtenaw County.

## WATER QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DATE	TIME	STREAM- FLOW, INSTAN- TANEOUS (CFS)	SPE- CIFIC CON- DUCT- ANCE (MICRO- MHOS)	PH (UNITS)	TEMPER- ATURE, AIR (DEG C)	TEMPER- ATURE (DEG C)	COLOR (PLAT- INUM- COBALT UNITS)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION)	OXYGEN DEMAND, BIO- CHEM- ICAL, 5 DAY (MG/L)	COLI- FORM, COM- PLETE (MPN)	COLI- FORM, FECAL, EC BROTH (MPN)
NOV 17...	1100	480	604	8.3	6.0	7.0	--	11.7	98	6.6	230	<30
JAN 19...	1545	334	659	8.2	-3.0	.0	--	13.6	99	--	--	--
24...	0945	375	620	8.1	-6.0	.5	--	13.9	98	3.2	430	<30
MAR 22...	1145	1990	542	8.1	8.5	1.0	30	14.0	100	3.8	110000	430
MAY 24...	1115	520	627	8.1	22.0	12.5	--	--	--	3.4	430	40
JUL 06...	1350	180	676	8.3	27.0	23.0	--	8.7	102	2.5	11000	30
SEP 06...	0900	67	708	8.0	21.0	21.5	--	5.6	64	4.5	2100	90

DATE	HARD- NESS (MG/L AS CAC03)	HARD- NESS, NONCAR- BONATE (MG/L CAC03)	CALCIUM DIS- SOLVED (MG/L AS CA)	MAGNE- SIUM, DIS- SOLVED (MG/L AS MG)	SODIUM, DIS- SOLVED (MG/L AS NA)	POTAS- SIUM, DIS- SOLVED (MG/L AS K)	BICAR- BONATE (MG/L AS HC03)	CAR- BONATE (MG/L AS C03)	ALKA- LINITY (MG/L AS CAC03)	CARBON DIOXIDE DIS- SOLVED (MG/L AS C02)	SULFATE DIS- SOLVED (MG/L AS S04)	CHLO- RIDE, DIS- SOLVED (MG/L AS CL)
NOV 17...	--	--	--	--	--	--	250	0	205	2.0	--	--
JAN 19...	--	--	--	--	--	--	280	0	230	2.8	--	--
24...	--	--	--	--	--	--	280	0	230	3.6	--	--
MAR 22...	240	76	70	17	19	2.7	200	0	164	2.5	62	38
MAY 24...	--	--	--	--	--	--	250	0	205	3.2	--	--
JUL 06...	--	--	--	--	--	--	240	0	197	1.9	--	--
SEP 06...	240	60	60	22	38	4.4	180	0	148	2.9	73	76

## STREAMS TRIBUTARY TO LAKE ERIE

379

04174800 HURON RIVER AT YPSILANTI, MI--CONTINUED

WATER-QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978--CONTINUED

DATE	FLUORIDE, DIS- SOLVED (MG/L AS F)	SILICA, DIS- SOLVED (MG/L AS SiO2)	SOLIDS, RESIDUE AT 180 DEG. C DIS- SOLVED (MG/L)	SOLIDS, SUM OF CONSTITUENTS, DIS- SOLVED (MG/L)	SOLIDS, DIS- SOLVED (TONS PER DAY)	NITRO- GEN, NITRATE TOTAL (MG/L AS N)	NITRO- GEN, NITRITE TOTAL (MG/L AS N)	NITRO- GEN, NO2+NO3 TOTAL (MG/L AS N)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N)	NITRO- GEN, ORGANIC TOTAL (MG/L AS N)	NITRO- GEN,AM- MONIA + ORGANIC TOTAL (MG/L AS N)
NOV 17...	--	--	--	--	--	.36	.04	.40	--	1.2	--	--
JAN 19...	--	--	--	--	--	--	--	--	--	--	--	--
24...	--	--	--	--	--	.65	.01	.66	--	1.4	--	--
MAR 22...	.1	7.5	337	310	1810	1.8	.08	1.9	1.9	.26	.94	1.2
MAY 24...	--	--	--	--	--	.52	.07	.59	--	1.4	--	--
JUL 06...	--	--	--	--	--	1.2	.05	1.2	--	.54	--	--
SEP 06...	.4	5.2	413	377	74.7	1.8	.18	2.0	2.0	.24	1.2	1.4

DATE	NITRO- GEN, TOTAL (MG/L AS N)	NITRO- GEN, TOTAL (MG/L AS NO3)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, ORTHO. TOTAL (MG/L AS P)	ARSENIC DIS- SOLVED (UG/L AS AS)	CADMIUM DIS- SOLVED (UG/L AS CD)	COBALT, DIS- SOLVED (UG/L AS CO)	IRON, DIS- SOLVED (UG/L AS FE)	LEAD, DIS- SOLVED (UG/L AS PB)	MANGA- NESE, DIS- SOLVED (UG/L AS MN)	MERCURY DIS- SOLVED (UG/L AS HG)	METHY- LENE BLUE ACTIVE SUB- STANCE (MG/L)
NOV 17...	--	--	.06	.03	--	--	--	--	--	--	--	.00
JAN 19...	--	--	--	--	--	--	--	--	--	--	--	--
24...	--	--	.07	.06	--	--	--	--	--	--	--	.00
MAR 22...	3.2	14	.19	.04	--	--	--	50	--	50	--	.00
MAY 24...	--	--	.03	.02	--	--	--	--	--	--	--	.00
JUL 06...	--	--	.06	.05	--	--	--	--	--	--	--	.00
SEP 06...	3.4	15	.08	.01	1	1	3	20	2	10	<.5	.00

## STREAMS TRIBUTARY TO LAKE ERIE

04174900 FORD LAKE NEAR RAWSONVILLE, MI

LOCATION.--Lat 42°12'22", long 83°33'28", in SW¼ sec.24, T.3 S., R.7 E., Washtenaw County, Hydrologic Unit 04090005, at upstream side of Ford Dam at Rawsonville Road, 1 mi (1.6 km) west of Rawsonville, 3.0 mi (4.8 km) upstream from Belleville Dam, 3.5 mi (5.6 km) southeast of Ypsilanti, 4.2 mi (6.8 km) downstream from gaging station at Ypsilanti, and 37.4 mi (60.2 km) upstream from mouth.

DRAINAGE AREA.--814 mi<sup>2</sup> (2,110 km<sup>2</sup>).

PERIOD OF RECORD.--Water years 1971 to current year.

COOPERATION.--Bimonthly samples were collected by the U.S. Geological Survey and were analyzed for nutrients, coliforms, and BOD by Canton Analytical Laboratory, Washtenaw County.

## WATER QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DATE	TIME	SPF- CIFIC CON- DUCT- ANCE (MICRO- MHOS)	PH (UNITS)	TEMPER- ATURE, AIR (DEG C)	TEMPER- ATURE (DEG C)	COLOR (PLAT- INUM- CORALT UNITS)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION)	OXYGEN DEMAND, BIO- CHEM- ICAL, 5 DAY (MG/L)	COLI- FORM, COM- PLETE (MPN)	COLI- FORM, FECAL, EC BROTH (MPN)
NOV 17...	1145	632	8.1	6.0	8.5	--	9.4	82	3.9	230	40
JAN 24...	1045	600	8.1	-3.0	.0	--	12.2	86	3.0	<30	<30
MAR 22...	1345	665	8.1	7.5	3.0	30	12.8	91	2.6	24000	40
JUL 06...	1455	629	8.1	29.0	23.0	--	5.9	69	1.9	430	<30
SEP 06...	1050	624	8.8	25.0	24.0	--	9.5	114	11	640	40

DATE	HARD- NESS (MG/L AS CACO3)	HARD- NESS, NONCAR- BONATE (MG/L CACO3)	CALCIUM DIS- SOLVED (MG/L AS CA)	MAGNE- SIUM, DIS- SOLVED (MG/L AS MG)	SODIUM, DIS- SOLVED (MG/L AS NA)	POTAS- SIUM, DIS- SOLVED (MG/L AS K)	BICAR- BONATE (MG/L AS HCO3)	CAR- BONATE (MG/L AS CO3)	ALKA- LINITY (MG/L AS CACO3)	CARBON DIOXIDE DIS- SOLVED (MG/L AS CO2)
NOV 17...	--	--	--	--	--	--	240	0	197	3.1
JAN 24...	--	--	--	--	--	--	280	0	230	3.6
MAR 22...	270	81	77	20	31	2.6	230	0	189	2.9
JUL 06...	--	--	--	--	--	--	220	0	180	2.8
SEP 06...	220	92	52	23	34	3.6	140	8	128	.4



04174900 FORD LAKE NEAR RAWSONVILLE, MI--CONTINUED

## WATER-QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978--CONTINUED

DATE	SULFATE DIS- SOLVED (MG/L AS S04)	CHLO- RIDE, DIS- SOLVED (MG/L AS CL)	FLUO- RIDE, DIS- SOLVED (MG/L AS F)	SILICA, DIS- SOLVED (MG/L AS SiO2)	SOLIDS, RESIDUE AT 180 DEG. C DIS- SOLVED (MG/L)	SOLIDS, SUM OF CONSTI- TUENTS, DIS- SOLVED (MG/L)	NITRO- GEN, NITRATE TOTAL (MG/L AS N)	NITRO- GEN, NITRITE TOTAL (MG/L AS N)	NITRO- GEN, NO2+NO3 TOTAL (MG/L AS N)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N)
NOV 17...	--	--	--	--	--	--	.56	.08	.64	--
JAN 24...	--	--	--	--	--	--	.91	.02	.93	--
MAR 22...	65	61	.2	8.1	484	378	1.1	.09	1.2	1.2
JUL 06...	--	--	--	--	--	--	.66	.04	.70	--
SEP 06...	65	75	.3	1.5	391	332	.10	.03	.13	.13

DATE	NITRO- GEN, AMMONIA TOTAL (MG/L AS N)	NITRO- GEN, ORGANIC TOTAL (MG/L AS N)	NITRO- GEN,AM- MONIA + ORGANIC TOTAL (MG/L AS N)	NITRO- GEN, TOTAL (MG/L AS N)	NITRO- GEN, TOTAL (MG/L AS NO3)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, ORTHO. TOTAL (MG/L AS P)	ARSENIC DIS- SOLVED (UG/L AS AS)	CADMIUM DIS- SOLVED (UG/L AS CD)	CHRO- MIUM, DIS- SOLVED (UG/L AS CR)
NOV 17...	1.3	--	--	--	--	.03	.03	--	--	--
JAN 24...	1.2	--	--	--	--	.05	.03	--	--	--
MAR 22...	.73	.77	1.5	2.7	12	.07	.02	--	--	--
JUL 06...	.84	--	--	--	--	.03	.02	--	--	--
SEP 06...	.98	1.7	2.7	2.7	12	.16	.05	1	1	0

DATE	COBALT, DIS- SOLVED (UG/L AS CO)	COPPER, DIS- SOLVED (UG/L AS CU)	IRON, DIS- SOLVED (UG/L AS FE)	LEAD, DIS- SOLVED (UG/L AS PB)	MANGA- NESE, DIS- SOLVED (UG/L AS MN)	MERCURY DIS- SOLVED (UG/L AS HG)	NICKEL, DIS- SOLVED (UG/L AS NI)	SELE- NIUM, DIS- SOLVED (UG/L AS SE)	ZINC, DIS- SOLVED (UG/L AS ZN)	METHY- LENE BLUE ACTIVE SUB- STANCE (MG/L)
NOV 17...	--	--	--	--	--	--	--	--	--	.00
JAN 24...	--	--	--	--	--	--	--	--	--	.00
MAR 22...	--	--	90	--	60	--	--	--	--	.00
JUL 06...	--	--	--	--	--	--	--	--	--	.00
SEP 06...	3	1	10	2	0	<.5	7	0	0	.00

## STREAMS TRIBUTARY TO LAKE ERIE

04175340 STONY CREEK AT OAKVILLE, MI

LOCATION.--Lat 42°05'05", long 83°34'43", in SE¼ SE¼ sec.34, T.4 S., R.7 E., Washtenaw County, Hydrologic Unit 04100001, on left bank at downstream side of bridge on Tuttle Hill Road, 300 ft (91 m) downstream from Paint Creek, and 0.2 mi (0.3 km) northeast of Oakville.

DRAINAGE AREA.--68.0 mi<sup>2</sup> (176.1 km<sup>2</sup>).

PERIOD OF RECORD.--January 1970 to current year.

GAGE.--Water-stage recorder. Altitude of gage is 645 ft (197 m) from topographic map (nearest 5 ft). Prior to July 31, 1970, non-recording gage at same site and datum.

REMARKS.--Records good except those for the winter period, which are fair, and those for periods of no gage-height record, Jan. 9 to Feb. 14 and June 1 to Aug. 16, which are poor. Several observations of water temperature were made during the year.

AVERAGE DISCHARGE.--8 years, 45.0 ft<sup>3</sup>/s (1.274 m<sup>3</sup>/s), 8.99 in/yr (228 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 860 ft<sup>3</sup>/s (24.4 m<sup>3</sup>/s) Mar. 21, 1978, gage height, 8.24 ft (2.512 m); maximum gage height, 8.31 ft (2.533 m) Feb. 20, 1971, backwater from ice; minimum discharge, 2.7 ft<sup>3</sup>/s (0.076 m<sup>3</sup>/s) Aug. 24, 1971, gage height, 1.00 ft (0.305 m).

EXTREMES FOR CURRENT YEAR.--Peak discharges above base of 300 ft<sup>3</sup>/s (8.50 m<sup>3</sup>/s) and maximum (\*):

Date	Time	Discharge (ft <sup>3</sup> /s) (m <sup>3</sup> /s)	Gage height (ft) (m)	Date	Time	Discharge (ft <sup>3</sup> /s) (m <sup>3</sup> /s)	Gage height (ft) (m)
Mar. 17	1800	642 18.2	7.78 2.371	Apr. 7	1000	439 12.4	7.23 2.204
Mar. 21	2000	*860 24.4	*8.24 2.512	Apr. 20	2400	436 12.3	7.22 2.201

Minimum discharge, 2.8 ft<sup>3</sup>/s (0.079 m<sup>3</sup>/s) Aug. 31, gage height, 1.01 ft (0.308 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	19	13	64	21	21	24	160	41	37	20	7.4	5.2
2	28	15	83	20	21	24	104	39	35	24	6.8	5.6
3	19	14	50	19	21	24	116	37	32	22	6.0	4.9
4	16	13	38	18	21	24	146	36	29	18	6.0	4.6
5	14	12	31	18	21	25	203	38	27	15	5.8	3.9
6	14	12	28	18	21	25	176	42	25	13	5.5	6.1
7	13	13	24	17	22	25	382	39	23	11	6.2	5.9
8	16	14	21	17	22	25	186	39	30	10	8.0	4.6
9	26	13	20	17	22	25	118	64	28	10	6.8	4.6
10	19	20	19	18	22	26	106	48	24	9.6	5.8	4.6
11	17	20	18	18	22	29	239	40	22	9.5	5.2	4.8
12	19	16	21	18	22	34	169	45	32	9.8	4.8	7.1
13	18	14	24	18	22	58	115	122	26	10	4.5	15
14	17	13	84	18	22	100	89	251	23	9.2	4.3	13
15	15	13	170	18	22	330	71	234	21	8.4	4.1	15
16	14	14	125	18	23	527	64	198	20	7.8	8.0	11
17	14	16	115	19	23	534	59	123	21	7.4	8.8	10
18	14	15	160	19	23	516	61	88	19	7.1	5.1	15
19	15	13	170	19	23	370	110	70	17	6.8	5.6	9.8
20	14	13	144	19	23	480	318	58	18	7.5	5.6	8.2
21	14	19	159	19	23	718	325	64	29	18	5.7	6.7
22	13	16	80	19	23	700	151	51	24	14	4.3	6.4
23	13	14	64	20	24	480	106	43	20	11	4.9	6.4
24	14	15	59	20	24	328	95	41	18	9.0	5.6	6.6
25	13	15	66	20	24	179	82	38	17	7.8	6.6	6.1
26	13	15	48	20	24	150	68	35	23	7.0	5.7	5.2
27	13	16	39	20	24	182	60	32	34	7.2	3.3	5.1
28	13	14	32	20	24	169	55	29	29	7.5	4.2	6.4
29	12	13	28	20	---	166	49	27	20	13	4.3	6.2
30	12	13	25	20	---	122	45	26	17	10	4.0	5.7
31	12	---	22	21	---	148	---	44	---	8.5	4.3	---
TOTAL	483	436	2031	586	629	6567	4028	2082	740	349.1	173.2	219.7
MEAN	15.6	14.5	65.5	18.9	22.5	212	134	67.2	24.7	11.3	5.59	7.32
MAX	28	20	170	21	24	718	382	251	37	24	8.8	15
MIN	12	12	18	17	21	24	45	26	17	6.8	3.3	3.9
CFSM	.23	.21	.96	.28	.33	3.12	1.97	.99	.36	.17	.08	.11
IN.	.26	.24	1.11	.32	.34	3.59	2.20	1.14	.40	.19	.09	.12

CAL YR 1977 TOTAL 13012.0 MEAN 35.6 MAX 479 MIN 5.2 CFSM .52 IN 7.12  
WTR YR 1978 TOTAL 18324.0 MEAN 50.2 MAX 718 MIN 3.3 CFSM .74 IN 10.02

## STREAMS TRIBUTARY TO LAKE ERIE

383

04175597 RIVER RAISIN NEAR SHARONVILLE, MI

LOCATION.--Lat 42°10'04", long 84°07'21", in SW¼ sec.31, T.3 S., R.3 E., Washtenaw County, Hydrologic Unit 04100002, at bridge on Sharon Valley Road, 2.0 mi (3.2 km) southwest of Sharonville, 4.0 mi (6.4 km) upstream from gaging station near Manchester, 4.0 mi (6.4 km) northwest of Manchester, and 113 mi (182 km) upstream from mouth.

DRAINAGE AREA.--121 mi<sup>2</sup> (313 km<sup>2</sup>).

PERIOD OF RECORD.--Water years 1971 to current year.

REMARKS.--Estimates of water discharge are based on streamflow records at gaging station near Manchester.

COOPERATION.--Bimonthly samples were collected by the U.S. Geological Survey and were analyzed for nutrients, coliforms, and BOD by Canton Analytical Laboratory, Washtenaw County.

## WATER QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DATE	TIME	STREAM- FLOW- INSTAN- TANEOUS (CFS)	SPE- CIFIC CON- DUCT- ANCE (MICRO- MHOS)	PH (UNITS)	TEMPER- ATURE, AIR (DEG C)	TEMPER- ATURE, WATER (DEG C)	COLOR (PLAT- INUM- COBALT UNITS)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION)	OXYGEN DEMAND, BIO- CHEM- ICAL, 5 DAY (MG/L)	COLI- FORM, COM- PLET (MPN)	COLI- FORM, FECAL, FC BROTH (MPN)	
NOV 17...	1445	F61	501	8.3	4.5	7.0	--	11.9	101	2.7	11000	<30
JAN 24...	1340	F71	460	7.9	-5.5	.0	--	11.8	83	--	--	--
JAN 25...	0945	F71	430	7.9	-2.5	.0	--	12.4	87	1.1	930	<30
MAR 24...	0900	F334	400	7.9	-5.0	.0	30	12.0	84	2.0	110000	<30
MAY 25...	1235	F334	546	8.0	26.5	18.5	--	8.4	80	1.9	4600	40
JUL 07...	1255	F79	395	8.6	29.5	23.0	--	6.7	79	1.3	110000	230
SEP 06...	1430	F25	449	8.2	29.5	23.5	--	7.3	88	2.6	2100	90

DATE	HAPO- NITR- (MG/L AS CACO3)	HAPO- NITR- NONCAR- BONATE (MG/L AS CACO3)	CALCIUM DTS- SOLVED (MG/L AS CA)	MAGNE- SIUM, DTS- SOLVED (MG/L AS MG)	SODIUM, DTS- SOLVED (MG/L AS NA)	POTAS- SIUM, DTS- SOLVED (MG/L AS K)	BICAR- BONATE (MG/L AS HCO3)	CAR- BONATE (MG/L AS C03)	ALKA- LITY (MG/L AS CACO3)	CARBON DIOXIDE DTS- SOLVED (MG/L AS C02)	SULFATE DTS- SOLVED (MG/L AS SO4)	CHLO- RIDE, DTS- SOLVED (MG/L AS CL)
NOV 17...	--	--	--	--	--	--	260	0	213	2.1	--	--
JAN 24...	--	--	--	--	--	--	260	0	213	5.2	--	--
JAN 25...	--	--	--	--	--	--	260	0	213	5.2	--	--
MAR 24...	190	42	53	14	9.0	2.1	180	0	148	3.6	35	16
MAY 25...	--	--	--	--	--	--	260	0	197	3.8	--	--
JUL 07...	--	--	--	--	--	--	260	8	227	1.1	--	--
SEP 06...	240	51	59	22	10	1.7	230	0	199	2.3	36	21

E--ESTIMATED VALUE

STREAMS TRIBUTARY TO LAKE ERIE  
04175597 RIVER RAISIN NEAR SHARONVILLE, MI--CONTINUED

WATER-QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978--CONTINUED

DATE	FLUO- DISE- SOLVED (MG/L AS F)	SILTCA- DISE- SOLVED (MG/L AS SiO2)	SOLIDS, RESIDUE AT 180 DEG. C DISE- SOLVED (MG/L)	SOLIDS, SUM OF CONSTIT- TUENTS, DISE- SOLVED (MG/L)	SOLIDS, DISE- SOLVED (TONS PER DAY)	NITRO- GEN, NITRATE TOTAL (MG/L AS N)	NITRO- GEN, NITRITE TOTAL (MG/L AS N)	NITRO- GEN, NO2+NO3 TOTAL (MG/L AS N)	NITRO- GEN, NO2+NO3 DISE- SOLVED (MG/L AS N)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N)	NITRO- GEN, ORGANIC TOTAL (MG/L AS N)	NITRO- GEN+AM- MONIA + ORGANIC TOTAL (MG/L AS N)
NOV 17...	--	--	--	--	--	.39	.01	.40	--	.52	--	--
JAN 24...	--	--	--	--	--	--	--	--	--	--	--	--
25...	--	--	--	--	--	.92	.01	.93	--	.26	--	--
MAR 24...	.1	7.3	248	225	246	.98	.02	1.0	1.0	.14	.76	.90
MAY 25...	--	--	--	--	--	.24	.01	.25	--	.94	--	--
JUL 07...	--	--	--	--	--	.34	.01	.35	--	.57	--	--
SEP 06...	.2	2.8	316	267	26.4	.22	.01	.23	.23	.04	.78	.82

DATE	NITRO- GEN, TOTAL (MG/L AS N)	NITRO- GEN, TOTAL (MG/L AS NO3)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, ORTHOPHOS- TOTAL (MG/L AS P)	ARSENIC DISE- SOLVED (UG/L AS AS)	CADMIUM DISE- SOLVED (UG/L AS CD)	CORALY- DISE- SOLVED (UG/L AS CO)	IRON, DISE- SOLVED (UG/L AS FE)	LEAD, DISE- SOLVED (UG/L AS PR)	MANGA- NESE, DISE- SOLVED (UG/L AS MN)	MERCURY DISE- SOLVED (UG/L AS HG)	METHY- LENE BLUE ACTIVE SUB- STANCE (MG/L)
NOV 17...	--	--	.06	.05	--	--	--	--	--	--	--	.00
JAN 24...	--	--	--	--	--	--	--	--	--	--	--	--
25...	--	--	.02	.01	--	--	--	--	--	--	--	.00
MAR 24...	1.0	8.4	.05	.01	--	--	--	90	--	20	--	.00
MAY 25...	--	--	.01	.00	--	--	--	--	--	--	--	.00
JUL 07...	--	--	.03	.01	--	--	--	--	--	--	--	.00
SEP 06...	1.1	4.9	.05	.00	2	1	3	10	1	40	.5	.00

## STREAMS TRIBUTARY TO LAKE ERIE

385

04175600 RIVER RAISIN NEAR MANCHESTER, MI

LOCATION.--Lat 42°10'05", long 84°04'34", in NE¼ SE¼ sec.33, T.3 S., R.3 E., Washtenaw County, Hydrologic Unit 04100002, on left bank 8 ft (2 m) downstream from bridge on Sharon Valley Road, and 2.5 mi (4.0 km) northwest of Manchester.

DRAINAGE AREA.--132 mi<sup>2</sup> (342 km<sup>2</sup>).

PERIOD OF RECORD.--January 1970 to current year.

GAGE.--Water-stage recorder. Altitude of gage is 900 ft (274 m) from topographic map (nearest 10 ft). Prior to July 30, 1970, non-recording gage at same site and datum.

REMARKS.--Records good except those for the winter period, which are fair. Occasional regulation by many dams above station. Several observations of water temperature were made during the year.

AVERAGE DISCHARGE.--8 years, 101 ft<sup>3</sup>/s (2.860 m<sup>3</sup>/s), 10.39 in/yr (264 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 565 ft<sup>3</sup>/s (16.0 m<sup>3</sup>/s) Mar. 5, 1976, gage height, 6.46 ft (1.969 m); minimum, 4.5 ft<sup>3</sup>/s (0.13 m<sup>3</sup>/s) Nov. 29, 1971; minimum gage height, 1.27 ft (0.387 m) Nov. 14, 1976.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 411 ft<sup>3</sup>/s (11.6 m<sup>3</sup>/s) Apr. 1, gage height, 5.55 ft (1.692 m), only peak above base of 280 ft<sup>3</sup>/s (7.93 m<sup>3</sup>/s); minimum, 8.6 ft<sup>3</sup>/s (0.24 m<sup>3</sup>/s) Aug. 4; minimum gage height, 1.31 ft (0.399 m) Sept. 27.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	86	35	100	100	70	62	496	134	74	78	26	17
2	97	54	139	95	70	61	383	125	69	80	25	17
3	86	55	122	92	70	60	365	116	68	108	26	17
4	70	48	102	90	70	59	380	107	63	106	9.5	16
5	62	57	88	88	70	58	390	103	59	100	17	18
6	56	45	81	86	70	58	375	108	55	92	18	31
7	51	51	73	84	70	58	385	104	53	88	15	31
8	54	55	68	82	70	57	360	106	53	81	16	20
9	64	55	64	81	70	57	335	133	53	72	20	10
10	61	70	59	81	70	60	320	129	53	66	20	11
11	58	78	56	80	70	64	330	123	50	60	20	12
12	61	68	54	80	70	68	318	127	50	53	21	19
13	57	76	52	80	70	77	298	159	56	49	24	26
14	51	69	85	80	70	90	274	227	52	46	23	26
15	47	59	139	80	70	120	256	254	44	45	19	26
16	45	59	133	80	70	125	241	248	44	42	15	26
17	37	65	134	79	69	130	226	234	44	38	27	25
18	48	66	162	79	68	140	214	219	44	34	26	29
19	45	58	192	79	66	148	220	199	42	29	25	31
20	44	58	204	79	64	172	224	187	40	29	25	30
21	40	73	217	79	64	286	235	190	56	32	20	30
22	42	69	183	78	63	391	237	178	63	46	15	28
23	44	63	185	78	63	390	228	170	55	42	19	26
24	48	63	194	78	62	378	216	158	49	38	27	25
25	46	63	187	78	62	360	204	146	46	38	18	23
26	43	62	160	87	62	362	187	133	67	30	13	23
27	46	57	145	80	62	375	173	118	105	46	18	18
28	39	55	130	76	62	383	163	83	101	35	21	20
29	33	56	120	72	---	402	152	87	91	34	18	24
30	31	54	110	71	---	384	143	86	84	33	16	15
31	31	---	105	70	---	390	---	82	---	28	17	---
TOTAL	1623	1796	3843	2522	1887	5825	8238	4573	1783	1698	619.5	670
MEAN	52.4	59.9	124	81.4	67.4	188	275	148	59.4	54.8	20.0	22.3
MAX	97	78	217	100	70	402	406	254	105	108	27	31
MIN	31	35	52	70	62	57	143	82	40	28	9.5	10
CFSM	.40	.45	.94	.62	.51	1.42	2.08	1.12	.45	.42	.15	.17
IN.	.46	.51	1.08	.71	.53	1.64	2.32	1.29	.50	.48	.17	.19

CAL YR 1977 TOTAL 27003.0 MEAN 74.0 MAX 330 MIN 12 CFSM .56 IN 7.61  
WTR YR 1978 TOTAL 35077.5 MEAN 96.1 MAX 406 MIN 9.5 CFSM .73 IN 9.89



## STREAMS TRIBUTARY TO LAKE ERIE

04175610 RIVER RAISIN AT MANCHESTER, MI

LOCATION.--Lat 42°08'52", long 84°00'56", in SE¼ sec.1, T.4 S., R.3 E., Washtenaw County, Hydrologic Unit 04100002, at bridge on Austin Road, 1.0 mi (1.6 km) east of Manchester, 0.6 mi (1.0 km) downstream from Ford Dam, 5.3 mi (8.5 km) downstream from gaging station near Manchester, and 104 mi (167 km) upstream from mouth.

DRAINAGE AREA.--148 mi<sup>2</sup> (383 km<sup>2</sup>).

PERIOD OF RECORD.--Water years 1971 to current year.

COOPERATION.--Bimonthly samples were collected by the U.S. Geological Survey and were analyzed for nutrients, coliforms, and BOD by Canton Analytical Laboratory, Washtenaw County.

## WATER QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DATE	TIME	STREAM STAGE (FT ABOVE DATUM)	SPE- CIFIC CON- DUCT- ANCE (MICRO- MHOS)	PH (UNITS)	TEMPER- ATURE, AIR (DEG C)	TEMPER- ATURE (DEG C)	COLOR (PLAT- INUM- COBALT UNITS)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION)	OXYGEN DEMAND, BIO- CHEM- ICAL, 5 DAY (MG/L)	COLI- FORM, COM- PLETE (MPN)	COLI- FORM, FECAL, EC BROTH (MPN)
NOV 17...	1415	43.51	518	8.3	7.0	6.0	--	12.0	98	3.1	4600	90
JAN 24...	1415	38.19	465	7.8	-5	.0	--	13.6	96	2.0	11000	2100
MAR 24...	1030	40.39	403	7.9	-5.0	.0	40	13.0	91	2.3	110000	<30
MAY 25...	1330	38.64	504	8.1	25.5	20.0	--	9.4	89	2.2	4600	90
JUL 07...	1345	38.14	398	7.9	31.5	24.0	--	8.0	94	1.5	24000	930
SEP 06...	1300	37.45	520	8.1	29.5	22.0	--	7.7	93	1.8	24000	2400

DATE	HARD- NESS (MG/L AS CAC03)	HARD- NESS, NONCAR- BONATE (MG/L CAC03)	CALCIUM DIS- SOLVED (MG/L AS CA)	MAGNE- SIUM, DIS- SOLVED (MG/L AS MG)	SODIUM, DIS- SOLVED (MG/L AS NA)	POTAS- SIUM, DIS- SOLVED (MG/L AS K)	BICAR- BONATE (MG/L AS HC03)	CAR- BONATE (MG/L AS CO3)	ALKA- LINITY (MG/L AS CAC03)	CARBON DIOXIDE DIS- SOLVED (MG/L AS CO2)	SULFATE DIS- SOLVED (MG/L AS SO4)	CHLO- RIDE, DIS- SOLVED (MG/L AS CL)
NOV 17...	--	--	--	--	--	--	280	0	230	2.2	--	--
JAN 24...	--	--	--	--	--	--	270	0	221	6.8	--	--
MAR 24...	190	42	54	14	7.9	2.0	180	0	148	3.6	35	15
MAY 25...	--	--	--	--	--	--	250	0	205	3.2	--	--
JUL 07...	--	--	--	--	--	--	240	0	197	4.8	--	--
SEP 06...	240	35	61	22	11	2.0	250	0	205	3.2	38	23

STREAMS TRIBUTARY TO LAKE ERIE

387

04175610 RIVER RAISIN AT MANCHESTER, MI--CONTINUED

WATER-QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978--CONTINUED

DATE	FLUO- RIDE, DIS- SOLVED (MG/L AS F)	SILICA, DIS- SOLVED (MG/L AS SI02)	SOLIDS, RESIDUE AT 180 DEG. C DIS- SOLVED (MG/L)	SOLIDS, SUM OF CONSTI- TUENTS, DIS- SOLVED (MG/L)	NITRO- GEN, NITRATE TOTAL (MG/L AS N)	NITRO- GEN, NITRITE TOTAL (MG/L AS N)	NITRO- GEN, NO2+NO3 TOTAL (MG/L AS N)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N)	NITRO- GEN, ORGANIC TOTAL (MG/L AS N)	NITRO- GEN,AM- MONIA + ORGANIC TOTAL (MG/L AS N)	NITRO- GEN, TOTAL (MG/L AS N)
NOV 17...	--	--	--	--	.34	.01	.35	--	.62	--	--	--
JAN 24...	--	--	--	--	.82	.01	.83	--	.38	--	--	--
MAR 24...	.1	7.4	245	224	1.2	.02	1.2	1.2	.10	.68	.78	2.0
MAY 25...	--	--	--	--	.24	.01	.25	--	1.1	--	--	--
JUL 07...	--	--	--	--	.46	.01	.47	--	.54	--	--	--
SEP 06...	.2	7.4	336	290	.39	.03	.42	.41	.09	.56	.65	1.1

DATE	NITRO- GEN, TOTAL (MG/L AS NO3)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, ORTHO, TOTAL (MG/L AS P)	ARSENIC DIS- SOLVED (UG/L AS AS)	CADMIUM DIS- SOLVED (UG/L AS CD)	COBALT, DIS- SOLVED (UG/L AS CO)	IRON, DIS- SOLVED (UG/L AS FE)	LEAD, DIS- SOLVED (UG/L AS PB)	MANGA- NESE, DIS- SOLVED (UG/L AS MN)	MERCURY DIS- SOLVED (UG/L AS HG)	METHY- LENE BLUE ACTIVE SUB- STANCE (MG/L)
NOV 17...	--	.03	.01	--	--	--	--	--	--	--	.00
JAN 24...	--	.04	.03	--	--	--	--	--	--	--	.00
MAR 24...	8.8	.03	.01	--	--	--	80	--	30	--	.00
MAY 25...	--	.01	.01	--	--	--	--	--	--	--	.00
JUL 07...	--	.03	.01	--	--	--	--	--	--	--	.00
SEP 06...	4.9	.06	.03	2	2	3	50	1	0	<.5	.00

## STREAMS TRIBUTARY TO LAKE ERIE

04175700 RIVER RAISIN NEAR TECUMSEH, MI

LOCATION.--Lat 41°56'35", long 83°56'45", in NE¼ sec.21, T.6 S., R.4 E., Lenawee County, Hydrologic Unit 04100002, on right bank 12 ft (4 m) downstream from former bridge site on North Raisin Center Highway, 3.4 mi (5.5 km) upstream from South Branch River Raisin, and 4.5 mi (7.2 km) south of Tecumseh.

DRAINAGE AREA.--267 mi<sup>2</sup> (692 km<sup>2</sup>).

PERIOD OF RECORD.--September 1956 to current year.

REVISED RECORDS.--WSP 2112: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 707.0 ft (215.49 m) National Geodetic Vertical Datum of 1929.

REMARKS.--Records good except those for the winter period, which are fair. Diurnal fluctuation caused by powerplant 5.5 mi (8.8 km) above station prior to June 27, 1968. Several observations of water temperature were made during the year.

AVERAGE DISCHARGE.--22 years, 180 ft<sup>3</sup>/s (5.098 m<sup>3</sup>/s), 9.16 in/yr (233 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 2,920 ft<sup>3</sup>/s (82.7 m<sup>3</sup>/s) June 26, 1968, gage height, 12.66 ft (3.859 m); minimum, 6.4 ft<sup>3</sup>/s (0.18 m<sup>3</sup>/s) Aug. 26, 1964, gage height, 2.57 ft (0.783 m); minimum daily, 8.5 ft<sup>3</sup>/s (0.24 m<sup>3</sup>/s) Oct. 30, 1965.

EXTREMES FOR CURRENT YEAR.--Peak discharges above base of 700 ft<sup>3</sup>/s (19.8 m<sup>3</sup>/s) and maximum (\*):

Date	Time	Discharge (ft <sup>3</sup> /s) (m <sup>3</sup> /s)	Gage height (ft) (m)	Date	Time	Discharge (ft <sup>3</sup> /s) (m <sup>3</sup> /s)	Gage height (ft) (m)
Mar. 22	0900	*1280 36.2	*10.19 3.106	Apr. 7	1500	1020 28.9	9.51 2.899

Minimum discharge, 33 ft<sup>3</sup>/s (0.93 m<sup>3</sup>/s) Aug. 9, gage height, 3.49 ft (1.064 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	140	86	141	180	120	105	792	271	151	132	65	45
2	136	82	218	175	125	105	769	225	144	141	61	43
3	117	96	233	170	125	105	714	246	137	157	61	42
4	118	96	202	165	120	100	670	184	131	161	59	42
5	115	104	142	160	120	100	808	207	127	157	56	41
6	107	95	172	160	120	100	788	216	159	151	51	41
7	102	104	161	155	120	100	946	214	149	144	58	41
8	108	102	145	150	120	100	856	216	109	119	159	46
9	113	105	130	150	120	100	724	233	88	124	42	50
10	109	121	125	145	120	105	655	238	110	118	61	47
11	111	130	120	145	120	115	743	233	109	111	59	42
12	109	143	115	145	120	120	724	228	111	106	60	55
13	109	128	110	145	120	130	638	280	118	96	58	71
14	128	120	200	145	120	145	552	428	113	77	57	64
15	120	121	278	145	120	322	500	541	111	83	59	66
16	103	122	284	140	120	408	462	528	102	88	67	62
17	100	120	280	140	120	390	426	500	101	83	64	67
18	88	118	306	140	120	344	409	434	100	78	55	76
19	86	117	485	140	115	354	418	397	97	75	59	71
20	98	118	485	140	115	413	495	347	79	71	61	68
21	116	120	515	140	110	781	544	308	120	67	56	67
22	93	121	470	140	110	1240	502	264	131	68	55	64
23	89	125	383	135	110	1080	458	270	121	76	52	61
24	95	127	323	130	110	1030	438	264	113	79	49	59
25	90	122	325	140	105	911	415	248	106	74	48	57
26	100	124	300	160	105	836	389	229	137	73	54	55
27	97	121	270	150	105	816	356	211	162	68	52	54
28	90	116	245	140	105	812	329	196	143	74	49	57
29	95	114	225	130	---	832	309	172	151	76	48	53
30	91	114	205	120	---	804	288	157	143	70	47	51
31	97	---	190	120	---	762	---	156	---	67	47	---
TOTAL	3270	3432	7823	4540	3260	13665	17117	8641	3673	3069	1829	1458
MEAN	105	114	252	146	116	441	571	279	122	99.0	59.0	55.3
MAX	140	143	515	180	125	1240	946	541	152	161	159	76
MIN	86	82	110	120	105	100	288	156	79	67	42	41
CFSM	.39	.43	.94	.55	.43	1.65	2.14	1.05	.46	.37	.22	.21
IN.	.46	.48	1.09	.63	.45	1.90	2.38	1.20	.51	.43	.25	.23

Cal. YR 1977	TOTAL	57891	MEAN 159	MAX 744	MIN 30	CFSM .60	IN 8.07
WTR YR 1978	TOTAL	71977	MEAN 197	MAX 1240	MIN 41	CFSM .74	IN 10.03

## STREAMS TRIBUTARY TO LAKE ERIE

389

04176000 RIVER RAISIN NEAR ADRIAN, MI

LOCATION.--Lat 41°54'15", long 83°58'50", in NW¼ sec.5, T.7 S., R.4 E., Lenawee County, Hydrologic Unit 04100002, on right bank 10 ft (3 m) downstream from bridge on Academy Road, 1.7 mi (2.7 km) east of Adrian, and 2.6 mi (4.2 km) downstream from South Branch River Raisin.

DRAINAGE AREA.--463 mi<sup>2</sup> (1,199 km<sup>2</sup>).

PERIOD OF RECORD.--October 1953 to September 1978 (discontinued as a continuous-record station; converted to a crest-stage partial-record station). Records for October 1930 to August 1931, October 1932 to April 1938, published as "Raisin River" in WSP 714, 744, 759, 784, 804, 824, and 854, have been found to be unreliable and should not be used.

REVISED RECORDS.--See PERIOD OF RECORD. WSP 2112: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 693.2 ft (211.29 m) National Geodetic Vertical Datum of 1929.

REMARKS.--Records good except those for the winter period, which are fair. Diurnal fluctuation caused by powerplant at Tecumseh, 11 mi (18 km) above station, prior to June 27, 1968. Several observations of water temperature were made during the year. National Weather Service gage-height telemark at station.

AVERAGE DISCHARGE.--25 years, 312 ft<sup>3</sup>/s (8.836 m<sup>3</sup>/s), 9.15 in/yr (232 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 5,580 ft<sup>3</sup>/s (158 m<sup>3</sup>/s) Apr. 30, 1956, gage height, 14.87 ft (4.532 m), from rating curve extended above 4,000 ft<sup>3</sup>/s (113 m<sup>3</sup>/s); minimum, 18 ft<sup>3</sup>/s (0.51 m<sup>3</sup>/s) Aug. 10, 1964, gage height, 1.33 ft (0.405 m); minimum daily, 25 ft<sup>3</sup>/s (0.71 m<sup>3</sup>/s) Oct. 26, 1965.

EXTREMES FOR CURRENT YEAR.--Peak discharges above base of 1,400 ft<sup>3</sup>/s (39.6 m<sup>3</sup>/s) and maximum (\*):

Date	Time	Discharge (ft <sup>3</sup> /s) (m <sup>3</sup> /s)	Gage height (ft) (m)	Date	Time	Discharge (ft <sup>3</sup> /s) (m <sup>3</sup> /s)	Gage height (ft) (m)
Dec. 21	0200	1500 42.5	10.65 3.246	Apr. 8	0600	2010 56.9	11.31 3.447
Mar. 23	0200	*4180 118	*13.90 4.237	Apr. 12	1500	1620 45.9	10.56 3.219

Minimum discharge, 59 ft<sup>3</sup>/s (1.67 m<sup>3</sup>/s) Sept. 4, 5, 7, gage height, 2.41 ft (0.735 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	217	148	264	310	190	165	1490	471	245	267	86	65
2	210	131	388	290	190	165	1440	437	235	276	80	63
3	203	146	478	280	190	160	1300	377	223	294	79	61
4	176	145	341	270	190	160	1190	341	212	325	77	60
5	192	157	316	260	190	155	1610	365	203	291	73	60
6	190	147	282	250	190	150	1840	391	212	263	67	61
7	183	153	243	245	185	150	1940	382	255	242	95	60
8	204	154	230	240	185	150	1970	385	196	204	284	63
9	206	155	210	235	180	150	1670	414	163	196	91	69
10	215	190	200	230	180	160	1370	407	179	185	93	71
11	224	183	200	230	180	165	1440	397	177	171	85	64
12	249	205	190	230	180	180	1620	388	184	159	81	90
13	191	185	180	225	185	200	1460	463	192	155	78	110
14	209	171	250	220	185	250	1130	655	179	123	75	100
15	208	166	450	220	180	571	890	866	173	133	78	101
16	188	170	668	220	180	818	783	923	167	126	85	91
17	206	167	697	215	180	970	713	866	155	119	85	107
18	164	164	751	215	180	997	678	734	155	113	75	122
19	170	162	1030	210	180	1010	704	634	150	106	75	123
20	174	168	1340	210	175	1090	862	570	128	103	76	104
21	206	171	1460	210	170	1960	1100	545	169	96	72	99
22	172	170	1300	210	170	3520	1100	460	188	97	72	95
23	167	177	992	205	165	3680	875	426	176	99	71	88
24	165	182	682	205	160	2590	756	424	165	104	67	84
25	156	176	638	200	160	2080	701	402	154	101	66	81
26	163	180	530	225	160	1760	651	375	241	97	70	79
27	165	163	470	245	160	1690	603	348	388	93	69	77
28	154	167	430	220	160	1700	558	324	482	93	67	79
29	153	160	390	205	---	1750	524	293	428	96	67	77
30	147	165	360	200	---	1690	496	262	317	90	65	73
31	149	---	340	190	---	1570	---	253	---	85	66	---
TOTAL	5776	4978	16350	7120	4980	31806	33454	14578	6491	4902	2570	2477
MEAN	186	166	527	230	178	1026	1115	470	216	158	82.9	82.6
MAX	249	205	1460	310	190	3680	1970	923	482	325	284	123
MIN	147	131	180	190	160	150	496	253	128	85	65	60
CFSM	.40	.36	1.14	.50	.38	2.22	2.41	1.02	.47	.34	.18	.18
IN.	.46	.40	1.31	.57	.40	2.56	2.69	1.17	.52	.39	.21	.20

CAI YR 1977	TOTAL	107404	MEAN	294	MAX	2240	MIN	59	CFSM	.64	IN	8.63
WTR YR 1978	TOTAL	135482	MEAN	371	MAX	3680	MIN	60	CFSM	.80	IN	10.89

## STREAMS TRIBUTARY TO LAKE ERIE

04176365 SALINE RIVER ABOVE SALINE, MI

LOCATION.--Lat 42°10'16", long 83°49'32", in SW¼ sec.34, T.3 S., R.5 E., Washtenaw County, Hydrologic Unit 04100002, at bridge on Dell Road, 2.5 mi (4.0 km) east of Saline, 6.9 mi (11.1 km) upstream from gaging station near Saline, 33 mi (53 km) upstream from River Raisin.

DRAINAGE AREA.--46 mi<sup>2</sup> (119 km<sup>2</sup>), approximately.

PERIOD OF RECORD.--Water years 1971 to current year.

COOPERATION.--Bimonthly samples were collected by the U.S. Geological Survey and were analyzed for nutrients, coliforms, and BOD by Canton Analytical Laboratory, Washtenaw County.

## WATER QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DATE	TIME	STREAM STAGE (FT ABOVE DATUM)	SPE- CIFIC CON- DUCT- ANCE (MICRO- MHOS)	PH (UNITS)	TEMPER- ATURE, AIR (DEG C)	TEMPER- ATURE (DEG C)	COLOR (PLAT- INUM- COBALT UNITS)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION)	OXYGEN DEMAND, BIO- CHEM- ICAL, 5 DAY (MG/L)	COLI- FORM, COM- PLETE (MPN)	COLI- FORM, FECAL, EC BROTH (MPN)
NOV 17...	1340	39.54	758	8.2	6.0	7.5	--	12.4	106	1.6	11000	430
JAN 25...	1045	40.61	660	7.8	-2.0	.0	--	11.7	82	1.6	930	90
MAR 24...	1150	42.54	472	7.5	-4.5	1.5	60	11.2	78	2.2	>240000	<30
MAY 24...	1530	39.98	719	8.0	26.0	18.5	--	--	--	1.5	4600	<30
JUL 06...	1615	39.78	774	8.2	27.5	20.0	--	9.8	115	1.0	23000	430
SEP 05...	1515	39.45	774	8.3	32.0	19.5	--	7.6	89	.9	24000	430

DATE	HARD- NESS (MG/L AS CAC03)	HARD- NESS, NONCAR- BONATE (MG/L CAC03)	CALCIUM DIS- SOLVED (MG/L AS CA)	MAGNE- SIUM, DIS- SOLVED (MG/L AS MG)	SODIUM, DIS- SOLVED (MG/L AS NA)	POTAS- SIUM, DIS- SOLVED (MG/L AS K)	BICAR- BONATE (MG/L AS HCO3)	CAR- BONATE (MG/L AS CO3)	ALKA- LINITY (MG/L AS CAC03)	CARBON DIOXIDE DIS- SOLVED (MG/L AS CO2)	SULFATE DIS- SOLVED (MG/L AS SO4)	CHLO- RIDE, DIS- SOLVED (MG/L AS CL)
NOV 17...	--	--	--	--	--	--	340	0	279	3.4	--	--
JAN 25...	--	--	--	--	--	--	310	0	254	7.9	--	--
MAR 24...	230	120	69	14	5.2	3.7	140	0	115	7.1	82	17
MAY 24...	--	--	--	--	--	--	290	0	238	4.6	--	--
JUL 06...	--	--	--	--	--	--	310	0	254	3.1	--	--
SEP 05...	390	130	110	29	10	2.4	320	0	262	2.6	110	27



## STREAMS TRIBUTARY TO LAKE ERIE

391

04176365 SALINE RIVER ABOVE SALINE, MI--CONTINUED

## WATER-QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978--CONTINUED

DATE	FLUO- RIDE, DIS- SOLVED (MG/L AS F)	SILICA, DIS- SOLVED (MG/L AS SiO2)	SOLIDS, RESIDUE AT 180 DEG. C DIS- SOLVED (MG/L)	SOLIDS, SUM OF CONSTI- TUENTS, DIS- SOLVED (MG/L)	NITRO- GEN, NITRATE TOTAL (MG/L AS N)	NITRO- GEN, NITRITE TOTAL (MG/L AS N)	NITRO- GEN, NO2+NO3 TOTAL (MG/L AS N)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N)	NITRO- GEN, ORGANIC TOTAL (MG/L AS N)	NITRO- GEN,AM- MONIA + ORGANIC TOTAL (MG/L AS N)	NITRO- GEN, TOTAL (MG/L AS N)
NOV 17...	--	--	--	--	.59	.01	.60	--	.49	--	--	--
JAN 25...	--	--	--	--	1.1	.01	1.1	--	.20	--	--	--
MAR 24...	.1	6.3	312	266	6.0	.07	6.1	6.1	.14	1.5	1.6	7.7
MAY 24...	--	--	--	--	1.4	.04	1.4	--	1.3	--	--	--
JUL 06...	--	--	--	--	1.3	.01	1.3	--	.52	--	--	--
SEP 05...	.4	12	493	459	.19	.01	.20	.18	.04	.33	.37	.56

DATE	NITRO- GEN, TOTAL (MG/L AS NO3)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, ORTHO. TOTAL (MG/L AS P)	ARSENIC DIS- SOLVED (UG/L AS AS)	CADMIUM DIS- SOLVED (UG/L AS CD)	COBALT, DIS- SOLVED (UG/L AS CO)	IRON, DIS- SOLVED (UG/L AS FE)	LEAD, DIS- SOLVED (UG/L AS PB)	MANGA- NESE, DIS- SOLVED (UG/L AS MN)	MERCURY DIS- SOLVED (UG/L AS HG)	NICKEL, DIS- SOLVED (UG/L AS NI)	METHY- LENE BLUE ACTIVE SUB- STANCE (MG/L)
NOV 17...	--	.02	.01	--	--	--	--	--	--	--	--	.00
JAN 25...	--	.02	.01	--	--	--	--	--	--	--	--	.00
MAR 24...	34	.12	.05	--	--	--	80	--	40	--	--	.00
MAY 24...	--	.05	.02	--	--	--	--	--	--	--	--	.00
JUL 06...	--	.04	.04	--	--	--	--	--	--	--	--	.00
SEP 05...	2.5	.03	.01	1	1	3	40	3	40	<.5	0	.00

## STREAMS TRIBUTARY TO LAKE ERIE

04176418 SALINE RIVER ABOVE MILAN, MI

LOCATION.--Lat 42°05'02", long 83°41'45", in SE¼ sec.34, T.4 S., R.6 E., Washtenaw County, Hydrologic Unit 04100002, at bridge on Platt Road, at Milan, 0.7 mi (1.1 km) upstream from dam at Milan, 9.9 mi (15.9 km) downstream from gaging station near Saline, and 16.2 mi (26.1 km) upstream from River Raisin.

DRAINAGE AREA.--112 mi<sup>2</sup> (290 km<sup>2</sup>), approximately.

PERIOD OF RECORD.--Water years 1971 to current year.

COOPERATION.--Bimonthly samples were collected by the U.S. Geological Survey and were analyzed for nutrients, coliforms, and BOD by Canton Analytical Laboratory, Washtenaw County.

## WATER QUALITY DATA. WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DATE	TIME	STREAM STAGE (FT ABOVE DATUM)	SPE- CIFIC CON- DUCT- ANCE (MICRO- MHOS)	PH (UNITS)	TEMPER- ATURE, AIR (DEG C)	TEMPER- ATURE (DEG C)	COLOR (PLAT- INUM- COBALT UNITS)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION)	OXYGEN DEMAND, BIO- CHEM- ICAL, 5 DAY (MG/L)	COLI- FORM, COM- PLETE (MPN)
NOV 17...	1250	34.56	980	8.0	5.5	7.0	--	9.5	80	3.0	2400
JAN 25...	1200	--	810	7.9	-1.0	.0	--	8.4	59	2.6	11000
MAR 24...	1335	36.14	446	7.7	-4.5	2.0	60	11.8	83	1.8	>240000
MAY 24...	1440	24.34	811	7.9	26.0	18.5	--	--	--	3.2	930
JUL 06...	1545	34.11	952	8.1	28.0	19.5	--	6.9	81	2.2	4600
SEP 05...	1245	33.98	1110	8.0	27.0	20.0	--	4.6	54	2.6	2400

DATE	COLI- FORM, FECAL, EC BROTH (MPN)	HARD- NESS (MG/L AS CAC03)	HARD- NESS, NONCAR- BONATE (MG/L AS CAC03)	CALCIUM DIS- SOLVED (MG/L AS CA)	MAGNE- SIUM, DIS- SOLVED (MG/L AS MG)	SODIUM, DIS- SOLVED (MG/L AS NA)	POTAS- SIUM, DIS- SOLVED (MG/L AS K)	BICAR- BONATE (MG/L AS HC03)	CAR- BONATE (MG/L AS C03)	ALKA- LITY (MG/L AS CAC03)	CARBON DIOXIDE DIS- SOLVED (MG/L AS CO2)
NOV 17...	40	--	--	--	--	--	--	320	0	262	5.1
JAN 25...	930	--	--	--	--	--	--	330	0	271	6.6
MAR 24...	<30	210	100	61	13	8.4	4.0	130	0	107	4.2
MAY 24...	150	--	--	--	--	--	--	290	0	238	5.8
JUL 06...	210	--	--	--	--	--	--	310	0	254	3.9
SEP 05...	40	350	120	95	27	100	4.7	280	0	230	4.5

## STREAMS TRIBUTARY TO LAKE ERIE

393

04176418 SALINE RIVER ABOVE MILAN, MI--CONTINUED

WATER-QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978--CONTINUED

DATE	SULFATE DIS- SOLVED (MG/L AS S04)	CHLO- RIDE, DIS- SOLVED (MG/L AS CL)	FLUO- RIDE, DIS- SOLVED (MG/L AS F)	SILICA, DIS- SOLVED (MG/L AS SiO2)	SOLIDS, RESIDUE AT 180 DEG. C DIS- SOLVED (MG/L)	SOLIDS, SUM OF CONSTI- TUENTS, DIS- SOLVED (MG/L)	NITRO- GEN, NITRATE TOTAL (MG/L AS N)	NITRO- GEN, NITRITE TOTAL (MG/L AS N)	NITRO- GEN, NO2+NO3 TOTAL (MG/L AS N)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N)
NOV 17...	--	--	--	--	--	--	2.1	.00	2.1	--
JAN 25...	--	--	--	--	--	--	1.3	.04	1.3	--
MAR 24...	67	21	.1	6.5	286	245	5.0	.09	5.1	5.1
MAY 24...	--	--	--	--	--	--	2.3	.15	2.5	--
JUL 06...	--	--	--	--	--	--	2.2	.01	2.2	--
SEP 05...	190	99	.4	10	688	675	2.5	.05	2.5	2.4

DATE	NITRO- GEN, AMMONIA TOTAL (MG/L AS N)	NITRO- GEN, ORGANIC TOTAL (MG/L AS N)	NITRO- GEN,AM- MONIA + ORGANIC TOTAL (MG/L AS N)	NITRO- GEN, TOTAL (MG/L AS N)	NITRO- GEN, TOTAL (MG/L AS NO3)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, ORTHO. TOTAL (MG/L AS P)	ARSENIC DIS- SOLVED (UG/L AS AS)	CADMIUM DIS- SOLVED (UG/L AS CD)	CHRO- MIUM, DIS- SOLVED (UG/L AS CR)
NOV 17...	.54	--	--	--	--	.13	.11	--	--	--
JAN 25...	1.3	--	--	--	--	.17	.15	--	--	--
MAR 24...	.18	1.3	1.5	6.5	29	.15	.06	--	--	--
MAY 24...	1.2	--	--	--	--	.15	.08	--	--	--
JUL 06...	.64	--	--	--	--	.18	.16	--	--	--
SEP 05...	.07	1.0	1.1	3.6	16	.47	.26	2	1	0

DATE	COBALT, DIS- SOLVED (UG/L AS CO)	COPPER, DIS- SOLVED (UG/L AS CU)	IRON, DIS- SOLVED (UG/L AS FE)	LEAD, DIS- SOLVED (UG/L AS PB)	MANGA- NESE, DIS- SOLVED (UG/L AS MN)	MERCURY DIS- SOLVED (UG/L AS HG)	NICKEL, DIS- SOLVED (UG/L AS NI)	SELE- NIUM, DIS- SOLVED (UG/L AS SE)	ZINC, DIS- SOLVED (UG/L AS ZN)	METHY- LENE BLUE ACTIVE SUB- STANCE (MG/L)
NOV 17...	--	--	--	--	--	--	--	--	--	.00
JAN 25...	--	--	--	--	--	--	--	--	--	.00
MAR 24...	--	--	50	--	30	--	--	--	--	.00
MAY 24...	--	--	--	--	--	--	--	--	--	.00
JUL 06...	--	--	--	--	--	--	--	--	--	.00
SEP 05...	3	2	40	2	70	<.5	18	0	10	.00

## STREAMS TRIBUTARY TO LAKE ERIE

04176500 RIVER RAISIN NEAR MONROE, MI  
(National stream-quality accounting network station)

LOCATION.--Lat 41°57'38", long 83°31'52", Monroe County, Hydrologic Unit 04100002, on left bank 0.8 mi (1.3 km) downstream from bridge on Ida Maybee Road, 5.0 mi (8.0 km) downstream from Saline River, and 7.5 mi (12.1 km) west of Monroe.

DRAINAGE AREA.--1,042 mi<sup>2</sup> (2,699 km<sup>2</sup>).

## WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--September 1937 to current year. Published as "Raisin River at Monroe" 1937-52 and as "River Raisin at Monroe" 1952-53.

REVISED RECORDS.--WSP 954: 1938-40(m), 1941. WSP 1437: 1939, 1948. WSP 2112: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 616.26 ft (187.836 m) National Geodetic Vertical Datum of 1929. Prior to Oct. 1, 1953, at site 9 mi (14 km) downstream at datum 46.26 ft (14.100 m) lower.

REMARKS.--Water-discharge records good except those for the winter period, and those for period of no gage-height record, Nov. 3 to Dec. 5, which are fair. Diurnal fluctuation caused by powerplants above station prior to June 27, 1968.

AVERAGE DISCHARGE.--41 years, 697 ft<sup>3</sup>/s (19.74 m<sup>3</sup>/s), 9.08 in/yr (231 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 12,900 ft<sup>3</sup>/s (365 m<sup>3</sup>/s) May 19, 1945, Mar. 29, 1950; maximum gage height, 10.7 ft (3.26 m) Feb. 1, 1949, backwater from ice, site and datum then in use; minimum discharge, about 2 ft<sup>3</sup>/s (0.06 m<sup>3</sup>/s) Sept. 4, 1938, Sept. 19, 20, 1941, site then in use.

EXTREMES FOR CURRENT YEAR.--Peak discharges above base of 3,500 ft<sup>3</sup>/s (99.1 m<sup>3</sup>/s) and maximum (\*):

Date	Time	Discharge (ft <sup>3</sup> /s) (m <sup>3</sup> /s)	Gage height (ft) (m)	Date	Time	Discharge (ft <sup>3</sup> /s) (m <sup>3</sup> /s)	Gage height (ft) (m)
Dec. 20	2400	4050 115	6.59 2.009	Apr. 7	1100	5080 144	7.26 2.213
Mar. 23	0700	*12400 351	*9.95 3.033				

Minimum discharge, 79 ft<sup>3</sup>/s (2.24 m<sup>3</sup>/s) Sept. 10, gage height, 2.04 ft (0.622 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	335	194	450	770	310	270	3990	747	473	1720	120	93
2	316	193	1000	702	315	270	3350	686	430	1020	120	91
3	304	198	1350	622	320	270	2950	639	403	797	128	88
4	298	200	1100	582	320	260	2960	586	380	820	130	86
5	282	210	920	504	320	260	3850	541	362	786	112	84
6	253	200	711	510	310	250	3560	502	350	706	105	84
7	250	200	491	490	310	250	4810	505	345	598	118	88
8	267	210	440	460	305	250	4230	528	379	490	161	86
9	280	210	400	440	300	250	3960	552	415	425	205	84
10	342	250	360	430	300	255	3500	570	372	357	301	82
11	377	250	330	420	300	265	3480	566	311	313	198	86
12	353	270	310	410	300	280	2960	556	296	284	141	112
13	342	250	290	397	300	290	2590	621	369	262	133	150
14	340	235	500	389	300	490	2360	1410	338	246	120	150
15	291	220	1390	390	300	1230	2080	1880	322	222	120	150
16	270	220	1810	390	305	1770	1690	2210	299	192	122	140
17	267	225	2310	380	310	2490	1360	2170	284	185	118	180
18	249	225	3120	370	305	2880	1210	1930	265	173	118	240
19	240	225	3740	370	300	3120	1260	1610	248	164	125	250
20	240	225	3660	360	290	4190	2110	1330	236	155	118	220
21	222	230	3780	360	280	7810	2640	1320	245	147	108	190
22	217	230	3360	350	275	11200	2510	1210	291	133	100	163
23	231	235	3020	345	270	12000	2290	1000	282	125	100	144
24	230	240	2650	340	260	10500	1990	845	278	130	100	137
25	214	240	2310	340	260	8000	1620	760	249	130	95	129
26	215	240	1750	380	260	6180	1340	707	265	130	95	122
27	208	220	1450	410	265	5000	1140	658	598	138	91	118
28	200	225	1070	380	270	4620	1010	612	1960	136	95	118
29	205	220	981	340	---	4700	904	570	2730	125	102	109
30	200	220	921	315	---	4350	815	533	2640	120	98	114
31	193	---	860	310	---	4200	---	502	---	125	93	---
TOTAL	8231	6710	46834	13256	8260	98150	74519	28856	16415	11354	3890	3888
MEAN	266	224	1511	428	295	3166	2484	931	547	366	125	130
MAX	377	270	3780	770	320	12000	4810	2210	2730	1720	301	250
MIN	193	193	290	310	260	250	815	502	236	120	91	82
CFSM	.26	.22	1.45	.41	.28	3.04	2.38	.89	.53	.35	.12	.13
IN.	.29	.24	1.67	.47	.29	3.50	2.66	1.03	.59	.41	.14	.14
CAL YR 1977 TOTAL	229888			MEAN 630	MAX 5480	MIN 79	CFSM .61	IN 8.21				
WTR YR 1978 TOTAL	320363			MEAN 878	MAX 12000	MIN 82	CFSM .84	IN 11.44				

## STREAMS TRIBUTARY TO LAKE ERIE

395

04176500 RIVER RAISIN NEAR MONROE, MI--CONTINUED

## WATER-QUALITY RECORDS

PERIOD OF RECORD.--January to September 1978.

PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE: April to September 1978.

WATER TEMPERATURES: April to September 1978.

REMARKS.--Daily specific conductance and water temperature records are based on once-daily measurements by a local observer, between 1600 and 1900 hours. Depth-integrated monthly samples are collected as a cross-section sample at gaging station or at bridge .8 mi (1.3 km) upstream on Ida Maybee Road.

EXTREMES FOR PERIOD OF DAILY RECORD.--

SPECIFIC CONDUCTANCE: Maximum daily, 1,010 micromhos Sept. 11, 1978; minimum daily, 382 micromhos, June 29, 1978.

WATER TEMPERATURES: Maximum daily, 30.0°C July 22, 1978; minimum daily, 9.0°C Apr. 20, 21, 23, 1978.

EXTREMES OUTSIDE PERIOD OF DAILY RECORD.--A water temperature of 0°C was observed Jan. 19, Feb. 17, Mar. 17, 1978.

## WATER QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DATE	TIME	STREAM- FLOW, INSTAN- TANEOUS (CFS)	SPE- CIFIC CON- DUCT- ANCE (MICRO- MHOS)	PH (UNITS)	TEMPER- ATURE (DEG C)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION)	COLI- FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML)	STREP- TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML)	HARD- NESS (MG/L AS CAC03)	HARD- NESS, NONCAR- BONATE (MG/L CAC03)
JAN											
19...	1030	410	894	8.0	.0	13.6	94	44	21	380	130
FEB											
17...	1115	445	874	8.0	.0	11.2	78	K12	32	380	130
MAR											
17...	1000	2490	472	7.6	.0	12.0	84	--	K860	200	59
APR											
19...	1245	1270	620	8.1	9.5	10.8	97	230	K110	290	89
MAY											
15...	1430	1850	612	8.2	14.0	8.6	85	2100	8400	280	88
JUN											
15...	1200	330	837	--	21.0	9.5	107	K90	K290	370	110
JUL											
11...	1515	325	750	8.6	26.0	11.1	137	180	370	360	--
AUG											
24...	1100	110	900	8.5	23.0	9.6	114	K100	K4000	370	170
SEP											
21...	1230	140	763	8.2	23.5	6.4	76	K1900	K470	310	120

K--BASED ON COLONY COUNT OUTSIDE THE ACCEPTABLE RANGE (NON-IDEAL COLONY COUNT)

DATE	CALCIUM DIS- SOLVED (MG/L AS CA)	MAGNE- SIUM, DIS- SOLVED (MG/L AS MG)	SODIUM, DIS- SOLVED (MG/L AS NA)	SODIUM AD- SORP- TION RATIO	SODIUM PERCENT	POTAS- SIUM, DIS- SOLVED (MG/L AS K)	BICAR- BONATE (MG/L AS HC03)	CAR- BONATE (MG/L AS C03)	ALKA- LINITY (MG/L AS CAC03)	CARBON DIOXIDE DIS- SOLVED (MG/L AS C02)	SULFATE DIS- SOLVED (MG/L AS S04)
JAN											
19...	110	25	25	.6	12	12	300	0	250	4.8	140
FEB											
17...	110	25	27	.6	13	17	300	0	246	4.8	140
MAR											
17...	58	13	14	.4	13	5.2	170	0	139	6.8	51
APR											
19...	83	19	13	.3	9	6.6	240	0	200	3.1	81
MAY											
15...	81	18	13	.3	9	2.6	230	0	190	2.3	69
JUN											
15...	110	24	25	.6	12	22	280	20	263	--	140
JUL											
11...	110	21	18	.4	9	11	270	--	--	1.7	110
AUG											
24...	110	23	35	.8	16	22	250	--	205	1.3	180
SEP											
21...	86	22	35	.9	20	7.0	230	0	189	2.3	120



STREAMS TRIBUTARY TO LAKE ERIE  
04176500 RIVER RAISIN NEAR MONROE, MI--CONTINUED

WATER-QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978--CONTINUED

DATE	CHLO- RIDE, DIS- SOLVED (MG/L AS CL.)	FLUO- RIDE, DIS- SOLVED (MG/L AS F)	SILICA, DIS- SOLVED (MG/L AS SiO2)	SOLIDS, RESIDUE AT 180 DEG. C DIS- SOLVED (MG/L)	SOLIDS, SUM OF CONSTITUENTS, DIS- SOLVED (MG/L)	SOLIDS, DIS- SOLVED (TONS PER DAY)	NITRO- GEN, NO2+NO3 TOTAL (MG/L AS N)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N)	NITRO- GEN, ORGANIC TOTAL (MG/L AS N)	NITRO- GEN,AM- MONIA + ORGANIC TOTAL (MG/L AS N)
JAN 19...	44	.3	10	543	514	601	1.8	.55	.55	1.1
FEB 17...	47	.2	10	560	524	673	1.4	.54	.76	1.3
MAR 17...	31	.1	5.5	317	262	2130	3.6	.52	1.2	1.7
APR 19...	32	.1	4.6	365	358	1250	2.7	.13	.97	1.1
MAY 15...	33	.2	4.3	391	334	1950	4.2	.13	1.5	1.6
JUN 15...	43	.2	7.2	589	529	525	1.2	.06	.94	1.0
JUL 11...	35	.2	5.7	513	--	450	2.2	.14	1.3	1.4
AUG 24...	55	.3	6.3	611	555	181	.05	.39	.71	1.1
SEP 21...	56	.2	8.9	473	448	179	1.4	.13	.82	.95

DATE	NITRO- GEN, NH4 + ORG. SUSP. TOTAL (MG/L AS N)	NITRO- GEN, AM- MONIA + ORGANIC DIS- SOLVED (MG/L AS N)	NITRO- GEN, TOTAL (MG/L AS N)	NITRO- GEN, TOTAL (MG/L AS NO3)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, DIS- SOLVED (MG/L AS P)	CARBON, ORGANIC TOTAL (MG/L AS C)	SEDI- MENT, SUS- PENDED (MG/L)	SEDI- MENT DIS- CHARGE, SUS- PENDED (T/DAY)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM
JAN 19...	.10	1.0	2.9	13	.17	.13	--	4	4.4	100
FEB 17...	.20	1.1	2.7	12	.21	.17	14	8	9.6	100
MAR 17...	.20	1.5	5.3	23	.26	.14	9.7	43	289	100
APR 19...	.21	.89	3.8	17	.12	.05	--	21	72	100
MAY 15...	.50	1.1	5.8	26	.20	.09	7.5	68	340	100
JUN 15...	.37	.63	2.2	9.7	.21	.12	5.2	23	20	100
JUL 11...	.71	.69	3.6	16	.21	.13	--	--	--	--
AUG 24...	.56	.54	1.2	5.1	.21	.09	5.9	27	8.0	100
SEP 21...	.48	.47	2.4	10	.29	.20	4.5	17	6.4	100

## STREAMS TRIBUTARY TO LAKE ERIE

397

04176500 RIVER RAISIN NEAR MONROE, MI--CONTINUED

## WATER-QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978--CONTINUED

DATE	TIME	ARSENIC TOTAL (UG/L AS AS)	ARSENIC DIS- SOLVED (UG/L AS AS)	BARIUM, TOTAL RECOV- ERABLE (UG/L AS RA)	BARIUM, DIS- SOLVED (UG/L AS BA)	CADMIUM TOTAL RECOV- ERABLE (UG/L AS CD)	CADMIUM DIS- SOLVED (UG/L AS CD)	CHRO- MIUM, TOTAL RECOV- ERABLE (UG/L AS CR)	CHRO- MIUM, DIS- SOLVED (UG/L AS CR)	CORALT, TOTAL RECOV- ERABLE (UG/L AS CO)
JAN 19...	1030	0	0	0	0	1	1	<10	2	0
APR 19...	1245	1	1	0	0	1	1	20	0	0
JUL 11...	1515	2	2	100	100	1	0	10	0	2

DATE	CORALT, DIS- SOLVED (UG/L AS CO)	COPPER, TOTAL RECOV- ERABLE (UG/L AS CU)	COPPER, DIS- SOLVED (UG/L AS CU)	IRON, TOTAL RECOV- ERABLE (UG/L AS FE)	IRON, DIS- SOLVED (UG/L AS FE)	LEAD, TOTAL RECOV- ERABLE (UG/L AS PB)	LEAD, DIS- SOLVED (UG/L AS PB)	MANGA- NESE, TOTAL RECOV- ERABLE (UG/L AS MN)	MANGA- NESE, DIS- SOLVED (UG/L AS MN)	MERCURY TOTAL RECOV- ERABLE (UG/L AS HG)
JAN 19...	0	6	3	290	10	6	--	--	50	<.5
APR 19...	0	9	2	1200	80	6	--	70	30	<.5
JUL 11...	0	6	3	710	30	16	3	70	10	.5

DATE	MERCURY DIS- SOLVED (UG/L AS HG)	SELE- NIUM, TOTAL (UG/L AS SE)	SELE- NIUM, DIS- SOLVED (UG/L AS SE)	SILVER, TOTAL RECOV- ERABLE (UG/L AS AG)	SILVER, DIS- SOLVED (UG/L AS AG)	ZINC, TOTAL RECOV- ERABLE (UG/L AS ZN)	ZINC, DIS- SOLVED (UG/L AS ZN)	CARBON, ORGANIC DIS- SOLVED (MG/L AS C)	CARBON, ORGANIC SUS- PENDED TOTAL (MG/L AS C)
JAN 19...	<.5	0	0	0	0	20	10	6.0	.3
APR 19...	<.5	1	1	0	0	20	0	1.0	1.0
JUL 11...	.5	0	0	0	0	40	10	7.4	1.9

QUALITATIVE AND ASSOCIATED QUANTITATIVE ANALYSES OF BIOLOGICAL DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
PERIPHYTON

DATE	TIME	LENGTH OF EXPO- SURE (DAYS)	PERI- PHYTON BIOMASS ASH W/FIGHT G/SQ M	PERI- PHYTON BIOMASS TOTAL W/FIGHT G/SQ M	CHLOR-A PERI- PHYTON CHROMO- GRAPHIC FLUOROM (MG/M2)	CHLOR-B PERI- PHYTON CHROMO- GRAPHIC FLUOROM (MG/M2)
FEB 17...	1115	29	.551	.866	.650	.000
MAY 15...	1430	26	16.9	19.1	3.26	.000
SEP 21...	1230	28	--	--	--	--

## DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

Discharge measurements made at low-flow partial-record stations during water year 1978--Continued

Station No.	Station name	Location	Drainage area (mi <sup>2</sup> )	Period of record	Measurements	
					Date	Discharge (ft <sup>3</sup> /s)
Streams tributary to Lake Michigan--Continued						
04119061	Plaster Creek at Wyoming, MI	Lat 42°56'15", long 85°41'24", NE¼ sec.2, T.6 N., R.12 W., Kent County, at Godfrey St., at Wyoming.	57.1	1974-78	01-18-78 05-22-78 07-31-78 09-11-78	26.2 38.1 17.4 17.5
*04120295	Black Creek near Muskegon, MI	Lat 43°12'14", long 86°09'52", in NE¼ NW¼ sec.1, T.9 N., R.16 W., Muskegon County, at bridge on Mill Iron Road, 4.8 miles east of Muskegon, and 4.9 miles upstream from mouth.	d39	1974-78	10-12-77 04-11-78 05-24-78 06-27-78 08-02-78 09-07-78	a50.8 a157 59.3 a85.2 41.8 35.0
*04126200	Little Manistee River near Freesoil, MI	Lat 44°11'00", long 86°10'00", in NE¼ NE¼ sec.31, T.21 N., R.15 W., Manistee County, on right bank 25 feet upstream from Six Mile bridge, 5.8 miles north of Freesoil, 7.4 miles upstream from mouth, and 9.0 miles southeast of Manistee.	200	1956-75† 1978	08-10-78 09-12-78	153 153
*04126600	Betsie River near Benzonia, MI	Lat 44°36'02", long 86°05'57", in NW¼ NW¼ sec.2, T.25 N., R.15 W., Benzie County, at bridge on highway US-31, 1.2 miles south of Benzonia, and 1.4 miles downstream from Homestead Dam.	d170	1974-78	04-13-78 07-31-78	a565 166
04126610	Crystal Lake Outlet near Benzonia, MI	Lat 44°37'56", long 86°08'41", in NW¼ NE¼ sec.29, T.26 N., R.15 W., Benzie County, at culvert on State Highway 115, 0.3 mile downstream from dam at outlet of Crystal Lake, and 2.5 miles west of Benzonia.	d32	1974-78	07-31-78	21.7
Streams tributary to Lake Huron						
04145930	South Branch Flint River near Lapeer, MI	Lat 43°02'35", long 83°17'04", in NW¼ sec.10, T.7 N., R.10 E., Lapeer County, at Morris Rd., 0.2 mile south of State Highway 21 and 1.5 miles southeast of Lapeer.	e77.8	1973-78	04-25-78 06-01-78 07-11-78 09-11-78	67.6 27.2 11.3 2.66
*04146020	South Branch Flint River near Millville, MI	Lat 43°04'44", long 83°18'25", in SE¼ sec.29, T.8 N., R.10 E., Lapeer County, at bridge on Saginaw Road, 1.6 miles north of Lapeer.	160	1974-78	04-25-78 06-01-78 07-11-78 09-11-78	125 47.0 20.5 7.77
Streams tributary to St. Clair River						
*04160350	Pine River near Rattle Run, MI	Lat 42°52'49", long 82°34'04", in NE¼ sec.9, T.5 N., R.16 E., St. Clair County, at bridge on Gratiot Road, 1.9 miles northeast of Rattle Run.	135	1974-78	10-25-77 07-11-78 08-08-78 09-06-78	2.88 2.36 .77 .34
Strams tributary to Lake St. Clair						
04161585	Stony Creek near Goodison, MI	Lat 42°45'49", long 83°04'28", in SW¼ sec.17, T.4 N., R.12 E., at Inwood Road, Macomb County, 5.2 miles northeast of Goodison.	34.6	1972-78	10-26-77 07-12-78 09-08-78	15.2 8.59 5.03

\* Also a crest-stage station.

† Operated as a continuous-record gaging station.

a Not base flow.

b Since 1970, affected by diversion for industrial use.

c Field estimate.

d Approximately.

e Revised.

## Crest-stage partial-record stations

The following table contains annual maximum discharge for crest-stage stations. A crest-stage gage is a device which will register the peak stage occurring between inspections of the gage. A stage-discharge relation for each gage is developed from discharge measurements made by indirect measurements of peak flow or by current meter. The date of the maximum discharge is not always certain, but is usually determined by comparison with nearby continuous-record stations, weather records, or local inquiry. Only the maximum discharge for each water year is given. Information on some lower floods may have been obtained but is not published herein. The years given in the period of record represent water years for which the annual maximum has been determined.

Annual maximum discharge at crest-stage partial-record stations during water year 1978

Station No.	Station name	Location	Drainage area (mi <sup>2</sup> )	Period of record	Date	Annual maximum Gage height (feet)	Dis-charge (ft <sup>3</sup> /s)
Streams tributary to Lake Superior							
04032000	Presque Isle River near Tula, MI	Lat 46°32'49", long 89°46'38", in NW¼ sec.23, T.48 N., R.44 W., Gogebic County, at bridge on State Highway 28, 7 miles southwest of Merriweather, 5.5 miles downstream from Little Presque Isle River, and 2.0 miles east of Tula.	261	1945-73+ 1974-78	05-31-78	11.31	2,580
04039500	South Branch Ontonagon River at Ewen, MI	Lat 46°31'58", long 89°16'37", in NW¼ sec.26, T.48 N., R.40 W., Ontonagon County, on piers of old State Highway 28 bridge, at Ewen.	348	1939-41, 1942-71+ 1972-78	05-31-78	14.46	3,730
04041000	Perch River near Sidnaw, MI	Lat 46°31'06", long 88°39'48", in NE¼ sec.34, T.48 N., R.35 W., Baraga County, at State Highway 28, 2.5 miles east of Sidnaw.	63.1	1913-15+ 1957-78	08-23-78	9.73	572
04042500	Otter River near Elo, MI	Lat 46°50'09", long 88°38'12", in NE¼ NE¼ sec.8, T.51 N., R.34 W., Houghton County, 50 feet upstream from highway bridge, 1.6 miles north of Pelkie, 2.5 miles south of Elo, and 5.5 miles upstream from Otter Lake.	162	1943-72+ 1973-78	09-12-78	7.10	2,050
04044200	Carp Creek at Ishpeming, MI	Lat 46°29'11", long 87°41'21", in NW¼ sec.9, T.47 N., R.27 W., Marquette County, at bridge on Highway 41A, at Ishpeming.	16.5	1970-78	09-12-78	--	a440
04044813	Two Hearted River near Paradise, MI	Lat 46°41'57", long 85°25'19", in NW¼ SW¼ sec.27, T.50 N., R.9 W., Luce County, at foot bridge in State Forest Campground, 0.4 mile upstream from mouth, and 18 miles northwest of Paradise.	201	1973-78	05-15-78	b4.18	2,200
04045538	West Branch Waiska River near Brimley, MI	Lat 46°21'18", long 84°35'35", in SW¼ NW¼ sec.29, T.46 N., R.2 W., Chippewa County, at bridge on county road, 3.2 miles upstream from mouth, and 3.5 miles south of Brimley.	40.7	1973-78	05-14-78	6.63	426
04045559	East Branch Waiska River near Brimley, MI	Lat 46°25'07", long 84°28'24", in NW¼ NE¼ sec.6, T.46 N., R.1 W., Chippewa County, at bridge on county road, 4.0 miles upstream from mouth, and 4.7 miles east of Brimley.	31.9	1973-78	05-14-78	10.88	602
Streams tributary to Lake Michigan							
04049500	Manistique River at Germfask, MI	Lat 46°14'00", long 85°55'40", in SE¼ sec.4, T.44 N., R.13 W., Schoolcraft County, 600 feet upstream from bridge on State Highway 77, 1.0 mile south of Germfask.	341	1938-70+ 1971-78	05-15-78	5.88	1,400
04055000	Manistique River near Blaney, MI	Lat 46°05'05", long 86°03'35", in SE¼ sec.28, T.43 N., R.14 W., Schoolcraft County, 40 feet downstream from logging bridge, 0.5 mile downstream from Duck Creek, and 7 miles southwest of Blaney.	704	1938-70+ 1971-78	05-16-78	--	a4,000
04057000	Indian River near Manistique, MI	Lat 45°59'30", long 86°17'15", in NE¼ sec.34, T.42 N., R.16 W., Schoolcraft County, near outlet of Indian Lake, 2.4 miles northwest of Manistique.	302	1938-71+ 1972-78	05-20-78	5.30	821
04057900	Black River near Republic, MI	Lat 46°25'08", long 87°53'21", in NE¼ sec.2, T.46 N., R.29 W., Marquette County, at bridge on county road, 4.4 miles east of Republic.	34.4	1961-68+ 1970-78	09-12-78	5.26	714
04059400	Ten Mile Creek at Perronville, MI	Lat 45°48'38", long 87°22'00", in NW¼ NW¼ sec.2, T.39 N., R.25 W., Delta County, 1 mile northwest of Perronville.	38.4	1971-77+ 1978	09-14-78	4.37	372

See footnotes at end of the table

## Annual maximum discharge at crest-stage partial-record stations during water year 1978--Continued

Station No.	Station name	Location	Drainage area (mi <sup>2</sup> )	Period of record	Date	Annual maximum Gage height (feet)	Dis-charge (ft <sup>3</sup> /s)
Streams tributary to Lake Michigan--Continued							
04062300	Michigamme River at Republic, MI	Lat 46°23'03", long 87°58'48", in SE $\frac{1}{4}$ sec.18, T.46 N., R.29 W., Marquette County, on left bank 400 feet upstream from county highway bridge, 0.3 mile upstream from Trout Falls Creek, and 0.6 mile south of Republic.	240	1961-75 $\frac{1}{2}$ , 1976-78	09-14-78	5.10	1,800
04096020	Galien River near Union Pier, MI	Lat 41°49'39", long 86°39'21", in NE $\frac{1}{4}$ sec.32, T.7 S., R.20 W., Berrien County, on downstream side of bridge on Union Pier Road, 1.5 miles east of Union Pier.	86.1	1973-78	04-06-78	c8.74	720
04096312	Sand Creek at Litchfield, MI	Lat 42°01'45", long 84°46'47", in NE $\frac{1}{4}$ NW $\frac{1}{4}$ sec.21, T.5 S., R.4 W., Hillsdale County, on right bank 20 ft upstream from bridge on Herring Road, 1.0 mile southwest of Litchfield.	20.6	1975-77 $\frac{1}{2}$ , 1978	06-26-78	6.80	265
04096340	St. Joseph River at Clarendon, MI	Lat 42°07'51", long 84°51'56", in SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec.11, T.4 S., R.5 W., Calhoun County, on left bank 5 ft upstream from bridge on 22 Mile Road at Clarendon.	144	1975-77 $\frac{1}{2}$ , 1978	06-30-78	7.30	660
04097060	Little Portage Creek near Fulton, MI	Lat 42°05'19", long 85°23'29", in SW $\frac{1}{4}$ sec.29, T.4 S., R.9 W., Kalamazoo County, at bridge on 38th Street, 2.8 miles southwest of Fulton.	27.0	1965-67 $\frac{1}{2}$ , 1972-78	06-26-78	8.82	900
04097370	Flowerfield Creek at Flowerfield, MI	Lat 42°03'50", long 85°39'44", in SW $\frac{1}{4}$ sec.1, T.5 S., R.12 W., St. Joseph County, at Flowerfield Road, at Flowerfield.	42.6	1964-78	09-17-78	2.51	105
04098500	Fawn River near White Pigeon, MI	Lat 41°46'56", long 85°35'00", in SW $\frac{1}{4}$ sec.10, T.8 S., R.11 W., St. Joseph County, on right bank 0.3 mile downstream from bridge on county highway, 3.1 miles east of White Pigeon, and 3.5 miles upstream from Sherman Mill Creek.	192	1958-75 $\frac{1}{2}$ , 1976-78	04-07-78	4.35	512
04112700	Sycamore Creek near Mason, MI	Lat 42°36'38", long 84°27'58", in NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec.31, T.3 N., R.1 W., Ingham County, at bridge on Harper Road, 0.7 mile downstream from Aurelius and VeVoy Drain, and 2.6 miles northwest of Mason.	39.5	1975-78	03-24-78	9.59	305
04113090	Carrier Creek near Grand Ledge MI	Lat 42°43'36", long 84°39'16", in SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec.15, T.4 N., R.3 W., Eaton County, at bridge on St. Joe Highway, 3.7 miles upstream from mouth, and 4.0 miles south-east of Grand Ledge.	7.18	1975-78	03-23-78	4.69	82
04117000	Quaker Brook near Nashville, MI	Lat 42°33'57", long 85°05'37", in NW $\frac{1}{4}$ sec.13, T.2 N., R.7 W., Barry County, on left bank 150 feet upstream from culvert on county road, 500 feet upstream from small tributary, and 2.5 miles south of Nashville.	7.60	1955-75 $\frac{1}{2}$ , 1976-78	06-26-78	4.79	169
04119055	Plaster Creek at Grand Rapids, MI	Lat 42°54'46", long 85°39'02", in SE $\frac{1}{4}$ sec.7, T.6 N., R.11 W., Kent County, on right downstream side of bridge on 28th Street, at Grand Rapids.	46.6	1974-78	03-22-78	9.27	770
04119160	Buck Creek at Grandville, MI	Lat 42°54'09", long 85°45'46", in SE $\frac{1}{4}$ sec.18, T.6 N., R.12 W., Kent County, on right downstream side of bridge on Wilson Avenue, at Grandville.	50.5	1974-78	06-26-78	7.78	500
*04120295	Black Creek near Muskegon, MI	Lat 43°12'14", long 86°09'52", in NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec.1, T.9 N., R.16 W., Muskegon County, at bridge on Mill Iron Road, 4.8 miles east of Muskegon.	d39	1974-78	03-24-78	5.53	345
04121000	Muskegon River near Merritt, MI	Lat 44°20'08", long 84°53'24", in NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec.2, T.22 N., R.5 W., Missaukee County, on right bank 35 feet upstream from bridge on State Highway 55, 2.7 miles east of Merritt.	355	1946-73 $\frac{1}{2}$ , 1974-78	04-08-78	7.15	610
04122223	Pentwater River near Hart, MI	Lat 43°43'27", long 86°22'36", in NW $\frac{1}{4}$ SW $\frac{1}{4}$ sec.5, T.15 N., R.17 W., Oceana County, at culverts on county road, 0.8 mile downstream from hydroelectric plant on Hart Lake, 1.8 miles northwest of Hart.	d78	1975-78	04-09-78	3.82	237

See footnotes at end of the table



Annual maximum discharge at crest-stage partial-record stations during water year 1978--Continued

Station No.	Station name	Location	Drainage area (mi <sup>2</sup> )	Period of record	Date	Annual maximum Gage height (feet)	Dis-charge (ft <sup>3</sup> /s)
Streams tributary to Lake Michigan--Continued							
04122230	North Branch Pentwater River near Pentwater, MI	Lat 43°47'42", long 86°21'30", in NE¼ SE¼ sec.8, T.16 N., R.17 W., Oceana County, at bridge on U.S. Highway 31, 3.5 miles northeast of Pentwater.	d44	1975-78	04-09-78	2.62	210
04123500	Manistee River near Grayling, MI	Lat 44°41'35", long 84°50'50", in SW¼ NW¼ sec.31, T.27 N., R.4 W., Crawford County, on right bank 25 feet upstream from bridge on State Highway 72, 6.8 miles northwest of Grayling.	f131	1942-73+, 1974-78	09-19-78	1.07	251
04124500	East Branch Pine River near Tustin, MI	Lat 44°06'09", long 85°31'02", in NE¼ NW¼ sec.28, T.20 N., R.10 W., Osceola County, 75 feet downstream from highway bridge, 3.0 miles west of Tustin.	d63	1953-63+, 1964-78	04-07-78	4.32	310
*04126200	Little Manistee River near Freesoil, MI	Lat 44°11'00", long 86°10'00", in NE¼ NE¼ sec.31, T.21 N., R.15 W., Manistee County, on right bank 25 feet upstream from Six Mile Bridge, 5.8 miles north of Freesoil, 7.4 miles upstream from mouth, and 9.0 miles southeast of Manistee.	200	1956-75+, 1976-78	04-09-78	3.01	397
*04126600	Betsie River near Benzonia, MI	Lat 44°36'02", long 86°05'57", in NW¼ NW¼ sec.2, T.25 N., R.15 W., Benzie County, at bridge on U.S. Highway 31, 1.2 miles south of Benzonia.	d170	1975-78	05-14-78	3.60	750
04127850	Boyne River near Boyne City, MI	Lat 45°11'48", long 84°57'26", in NW¼ SW¼ sec.5, T.32 N., R.5 W., Charlevoix County, at culvert on Dam Road, 0.3 mile downstream from nonoperative hydroelectric plant, 2.8 miles southeast of Boyne City.	d65	1975-78	09-18-78	3.47	398
Streams tributary to Lake Huron							
04132000	Black River near Cheboygan, MI	Lat 45°29'59", long 84°19'36", in NW¼ NW¼ sec.21, T.36 N., R.1 E., Cheboygan County, on left bank 0.3 mile downstream from Black Lake, 5.3 miles upstream from Alverno Dam, and 12.6 miles southeast of Cheboygan.	597	1942-74+, 1975-78	05-18-78	3.41	1,480
04132500	Thunder Bay River near Hillman, MI	Lat 45°00'30", long 83°58'21", in NE¼ SE¼ sec.8, T.30 N., R.4 E., Montmorency County, on left bank 25 feet upstream from bridge on State Highway 32, 5.2 miles southwest of Hillman.	232	1946-72+, 1973-78	04-12-78	8.20	810
04138000	East Branch Au Gres River at McIvor, MI	Lat 44°13'57", long 83°42'03", in NW¼ NW¼ sec.10, T.21 N., R.6 E., Iosco County, on right bank 25 feet downstream from bridge on Whittenmore Road at McIvor, and 11.5 miles upstream from mouth.	d84	1950-73+, 1974-78	04-07-78	5.79	393
04138600	Gamble Creek at Lupton, MI	Lat 44°25'26", long 84°01'32", in SW¼ SW¼ sec.36, T.24 N., R.3 E., Ogemaw County, at culvert on Lupton Road, 0.5 mile south of Lupton.	9.47	1953-56, 1959-78	04-07-78	4.42	99
04138700	Bixby Creek near Rose City, MI	Lat 44°26'06", long 84°07'16", in NE¼ NW¼ sec.31, T.24 N., R.3 E., Ogemaw County, at bridge on State Highway 33, 0.9 mile north of Rose City.	2.68	1953-78	04-07-78	3.48	70
04138800	Houghton Creek at Rose City, MI	Lat 44°25'17", long 84°06'34", in NE¼ NE¼ sec.6, T.23 N., R.3 E., Ogemaw County, at bridge on Pose City Road, 0.3 mile east of Rose City.	13.3	1953-78	04-07-78	2.34	231
04138900	Wilkins Creek near Rose City, MI	Lat 44°24'18", long 84°06'59", in NE¼ NW¼ sec.7, T.23 N., R.3 E., Ogemaw County, at bridge on State Highway 33, 1.1 miles south of Rose City.	9.15	1953-78	04-07-78	2.97	134
04139000	Houghton Creek near Lupton, MI	Lat 44°23'45", long 84°02'50", in SE¼ SE¼ sec.10, T.23 N., R.3 E., Ogemaw County, 2.7 miles southwest of Lupton.	29.7	1950-72+, 1973-78	04-07-78	5.22	319

See footnotes at end of the table

## Annual maximum discharge at crest-stage partial-record stations during water year 1978--Continued

Station No.	Station name	Location	Drainage area (mi <sup>2</sup> )	Period of record	Date	Annual maximum Gage height (feet)	Discharge (ft <sup>3</sup> /s)
Streams tributary to Lake Huron--Continued							
04139500	Rifle River at "The Ranch" near Lupton, MI	Lat 44°23'36", long 84°02'18", in SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec.11, T.23 N., R.3 E., Ogemaw County, at downstream side of bridge, 2.7 miles south of Lupton.	56.8	1951-71 $\frac{1}{2}$ , 1972-78	04-07-78	9.38	462
04140000	Prior Creek near Selkirk, MI	Lat 44°20'06", long 84°04'06", in SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec.33, T.23 N., R.3 E., Ogemaw County, on right bank 20 feet upstream from culverts on Peters Road, 1.5 miles north of Selkirk.	21.4	1950-72 $\frac{1}{2}$ , 1973-78	04-07-78	5.37	241
04140200	Klacking Creek near Selkirk, MI	Lat 44°20'05", long 84°08'46", in NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec.2, T.22 N., R.2 E., Ogemaw County, at bridge on Campbell Road, 4.0 miles northwest of Selkirk.	7.51	1953-78	04-07-78	1.41	63
04141100	Shepards Creek near Selkirk, MI	Lat 44°18'27", long 84°05'05", in SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec.8, T.22 N., R.3 E., Ogemaw County, at bridge on Bettelyon Road, 1.1 miles southwest of Selkirk.	4.44	1953-78	04-06-78	e	d107
04144180	Jones Creek near Gaines, MI	Lat 42°53'02", long 83°52'27", in SE $\frac{1}{4}$ sec.28, T.6 N., R.5 E., Genesee County, at bridge on Baldwin Road, 1.7 miles northeast of Gaines.	7.60	1970-78	03-23-78	6.89	103
04144200	Porter Drain near Gaines, MI	Lat 42°53'26", long 83°50'59", in SE $\frac{1}{4}$ sec.27, T.6 N., R.5 E., Genesee County, at bridge on Seymour Road, 3.2 miles east of Gaines.	4.68	1970-78	03-23-78	3.95	61
04144220	Jones Creek at Duffield, MI	Lat 42°54'45", long 83°54'27", in SE $\frac{1}{4}$ sec.17, T.6 N., R.5 E., Genesee County, at bridge on Grand Blanc Road, 1.0 mile south of Duffield.	23.4	1970-78	03-23-78	8.05	353
*04146020	South Branch Flint River near Millville, MI	Lat 43°04'44", long 83°18'25", in SE $\frac{1}{4}$ sec.29, T.8 N., R.10 E., Lapeer County, on downstream right wingwall of bridge on Saginaw Road, 1.6 miles north of Lapeer.	160	1974-78	03-23-78	8.22	738
04147800	Powers-Cullen Drain near Genesee, MI	Lat 43°05'33", long 83°33'31", in SW $\frac{1}{4}$ sec.18, T.8 N., R.8 E., Genesee County, at bridge on Coldwater Road, 3.3 miles southeast of Genesee.	9.17	1970-78	03-23-78	3.15	183
04147900	Lefler-Scothan Drain near Otisville, MI	Lat 43°08'11", long 83°32'27", in NE $\frac{1}{4}$ sec.5, T.8 N., R.8 E., Genesee County, at bridge on Frances Road, 2.2 miles south of Otisville.	4.90	1970-78	03-23-78	5.26	106
04148120	Kearsley Creek near Atlas, MI	Lat 42°57'15", long 83°32'42", in NE $\frac{1}{4}$ sec.5, T.6 N., R.8 E., Genesee County, at bridge on Jordan Road, 1.2 miles north of Atlas.	f55.6	1970-78	03-23-78	7.05	320
04148139	Black Creek near Davison, MI	Lat 43°01'28", long 83°33'24", in SE $\frac{1}{4}$ sec.7, T.7 N., R.8 E., Genesee County, at bridge on Irish Road, 2.0 miles west of Davison.	22.8	1970-78	03-23-78	6.56	290
04148144	Chipmunk Creek near Genesee, MI	Lat 43°04'01", long 83°36'59", in SE $\frac{1}{4}$ sec.27, T.8 N., R.7 E., Genesee County, at bridge on Genesee Road, 3.1 miles south of Genesee.	f5.49	1970-78	03-22-78	3.50	81
04148200	Swartz Creek near Holly, MI	Lat 42°49'39", long 83°37'42", in SW $\frac{1}{4}$ sec.15, T.5 N., R.7 E., Oakland County, on right bank 25 feet downstream from bridge on Elliot Road, 2.4 miles north of Holly.	f12.1	1956-75 $\frac{1}{2}$ , 1976-78	03-24-78	2.89	44
04148255	Swartz Creek near Grand Blanc, MI	Lat 42°53'09", long 83°41'29", in SE $\frac{1}{4}$ sec.25, T.6 N., R.6 E., Genesee County, at bridge on Baldwin Road, 4.1 miles southwest of Grand Blanc.	36.0	1970-78	03-24-78	4.61	107
04148260	Swartz Creek near Swartz Creek, MI	Lat 42°58'22", long 83°45'43", in SW $\frac{1}{4}$ sec.28, T.7 N., R.6 E., Genesee County, at bridge on Bristol Road, 3.9 miles east of Swartz Creek.	f67.3	1970-78	03-23-78	7.98	714
04148265	Kimball Drain near Swartz Creek, MI	Lat 42°55'15", long 83°49'51", in NE $\frac{1}{4}$ sec.14, T.6 N., R.5 E., Genesee County, at bridge on Morrish Road, 2.4 miles south of Swartz Creek.	10.6	1970-78	03-23-78	5.99	152

See footnotes at end of the table

Annual maximum discharge at crest-stage partial-record stations during water year 1978--Continued

Station No.	Station name	Location	Drainage area (mi <sup>2</sup> )	Period of record	Date	Annual maximum Gage height (feet)	Dis-charge (ft <sup>3</sup> /s)
Streams tributary to Lake Hiron--Continued							
04148270	West Branch Swartz Creek near Swartz Creek, MI	Lat 42°58'22", long 83°46'08", in SW $\frac{1}{4}$ sec.28, T.7 N., R.6 E., Genesee County, at bridge on Bristol Road, 3.2 miles east of Swartz Creek.	f40.6	1970-78	03-23-78	7.80	600
04148410	Thread Creek near Goodrich, MI	Lat 42°53'19", long 83°32'10", in SE $\frac{1}{4}$ sec.29, T.6 N., R.8 E., Genesee County, at bridge on Baldwin Road, 2.4 miles southwest of Goodrich.	f28.8	1970-78	03-23-78	4.13	162
04148610	Cole Creek near Flushing, MI	Lat 43°02'44", long 83°51'06", in SW $\frac{1}{4}$ sec.35, T.8 N., R.5 E., Genesee County, at bridge on Potter Road, 1.2 miles south of Flushing.	8.51	1970-78	03-23-78	6.34	162
04148620	Freeman Drain near Montrose, MI	Lat 43°07'04", long 83°53'37", in SE $\frac{1}{4}$ sec.5, T.8 N., R.5 E., Genesee County, at bridge on Mt. Morris Road, 4.0 miles south of Montrose.	8.21	1970-78	03-23-78	5.91	230
04148640	Armstrong Creek near Montrose, MI	Lat 43°08'04", long 83°50'03", in SE $\frac{1}{4}$ sec.35, T.9 N., R.5 E., Genesee County, at bridge on Morrish Road, 4.1 miles southeast of Montrose.	f11.9	1970-78	03-23-78	5.97	175
04148740	Central-Stadler Drain near Montrose, MI	Lat 43°09'46", long 83°50'14", in SE $\frac{1}{4}$ sec.23, T.9 N., R.5 E., Genesee County, at bridge on Wilson Road, 3.1 miles east of Montrose.	f15.0	1970-78	03-23-78	4.27	140
04148800	Pine Run near Montrose, MI	Lat 43°12'42", long 83°48'54", in SE $\frac{1}{4}$ sec.1, T.9 N., R.5 E., Genesee County, at bridge on Elms Road, 4.7 miles northeast of Montrose.	f28.2	1970-78	03-22-78	g8.43	a420
04148900	Silver Creek near Clio, MI	Lat 43°12'54", long 83°45'55", in NW $\frac{1}{4}$ sec.4, T.9 N., R.6 E., Genesee County, at bridge on Weir Road, 3.0 miles northwest of Clio.	f3.70	1970-78	03-23-78	3.58	81
04149300	Misteguay Creek near Flushing, MI	Lat 43°01'31", long 83°54'41", in NE $\frac{1}{4}$ sec.7, T.7 N., R.5 E., Genesee County, at bridge on Duffield Road, 3.7 miles southwest of Flushing.	f17.3	1970-78	03-23-78	8.03	390
04151000	Cass River at Vassar, MI	Lat 43°22'15", long 83°34'52", in NW $\frac{1}{4}$ SW $\frac{1}{4}$ sec.7, T.11 N., R.8 E., Tuscola County, at bridge on State Highway 15, at Vassar.	710	1949-70 $\frac{1}{2}$ , 1971-78	03-25-78	13.22	6,820
04153500	Salt River near North Bradley, MI	Lat 43°42'10", long 84°28'14", in NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec.7, T.15 N., R.1 W., Midland County, at bridge on North Saginaw Road, 1.1 miles southeast of North Bradley.	138	1935-71 $\frac{1}{2}$ , 1972-78	04-01-78	13.30	2,420
04154500	Chippewa River near Midland, MI	Lat 43°35'40", long 84°22'10", in NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec.24, T.14 N., R.1 W., Midland County, on upstream side of bridge on Meridian Road, 6.5 miles southwest of Midland.	597	1947-72 $\frac{1}{2}$ , 1973-78	04-08-78	5.96	3,990
Streams tributary to St. Clair River							
04159900	Mill Creek near Avoca, MI	Lat 43°03'16", long 82°44'05", in NW $\frac{1}{4}$ sec.8, T.7 N., R.15 E., St. Clair County, on left bank at downstream side of bridge on Bricker Road, 0.2 mile upstream from Gleason Drain, and 2.3 miles west of Avoca.	169	1963-75 $\frac{1}{2}$ , 1976-78	03-23-78	h7.84	2,140
*04160350	Pine River near Rattle Run, MI	Lat 42°52'49", long 82°34'04", in NE $\frac{1}{4}$ sec.9, T.5 N., R.16 E., St. Clair County, on right downstream wingwall of bridge on Gratiot Road, 1.9 miles northeast of Rattle Run.	135	1974-78	03-23-78	19.77	2,760
Streams tributary to Lake St. Clair							
04161500	Paint Creek near Lake Orion, MI	Lat 42°46'03", long 83°13'12", in NE $\frac{1}{4}$ sec.13, T.4 N., R.10 E., Oakland County, on left bank 100 feet upstream from railroad bridge, 1.6 miles southeast of Lake Orion, and 2.8 miles upstream from Trout Creek.	38.5	1959-75 $\frac{1}{2}$ , 1976-78	03-23-78	e	a140

See footnotes at end of the table

## Annual maximum discharge at crest-stage partial-record stations during water year 1978--Continued

Station No.	Station name	Location	Drainage area (mi <sup>2</sup> )	Period of record	Date	Annual maximum Gage height (feet)	Dis-charge (ft <sup>3</sup> /s)
Streams tributary to Lake St. Clair--Continued							
04161760	West Branch Stony Creek near Washington, MI	Lat 42°43'53", long 83°06'02", in SE $\frac{1}{4}$ sec.25, T.4 N., R.11 E., Oakland County, at bridge on Huron-Clinton Metropolitan Park Road, and 3.4 miles west of Washington.	22.5	1965-78	03-25-78	3.12	110
04164010	North Branch Clinton River at Almont, MI	Lat 42°54'59", long 83°02'42", in NE $\frac{1}{4}$ sec.28, T.6 N., R.12 E., Lapeer County, at bridge on State Highway 53, at Almont.	9.56	1959-62, 1963-68 $\frac{1}{2}$ , 1969-78	03-23-78	4.01	190
04164050	North Branch Clinton River near Romeo, MI	Lat 42°49'11", long 82°58'35", in NW $\frac{1}{4}$ sec.31, T.5 N., R.13 E., Macomb County, at bridge on 35 Mile Road, 2.2 miles northeast of Romeo.	49.7	1959-64, 1965-69 $\frac{1}{2}$ , 1970-78	03-23-78	13.65	785
04164150	North Branch Clinton River near Meade, MI	Lat 42°43'50", long 82°54'23", in NE $\frac{1}{4}$ sec.34, T.4 N., R.13 E., Macomb County, on left bank at bridge on 27 Mile Road, 1.9 miles northwest of Meade.	89.6	1959-67, 1968-72 $\frac{1}{2}$ , 1973-78	03-24-78	16.49	1,080
04164200	Coon Creek near Armada, MI	Lat 42°47'41", long 82°52'58", in SW $\frac{1}{4}$ sec.1, T.4 N., R.13 E., Macomb County, at bridge on North Road, 3.4 miles south of Armada.	10.0	1959-65, 1966-70 $\frac{1}{2}$ , 1971-78	03-24-78	5.25	146
04164250	Tupper Brook at Ray Center, MI	Lat 42°45'42", long 82°54'04", in NW $\frac{1}{4}$ sec.23, T.4 N., R.13 E., Macomb County, at bridge on 29 Mile Road, at Ray Center.	8.62	1959, 1960-64 $\frac{1}{2}$ , 1965-78	03-22-78	5.18	104
04164350	Highbank Creek near Armada, MI	Lat 42°28'24", long 82°51'08", in NW $\frac{1}{4}$ sec.6, T.4 N., R.14 E., Macomb County, at bridge on 32 Mile Road, 3.0 miles southeast of Armada.	14.9	1959-65, 1966-70 $\frac{1}{2}$ , 1971-78	03-23-78	15.08	560
04164360	East Branch Coon Creek near New Haven, MI	Lat 42°45'46", long 82°50'57", in NW $\frac{1}{4}$ sec.19, T.4 N., R.14 E., Macomb County, at bridge on 29 Mile Road, 3.4 miles northwest of New Haven.	36.1	1959-66, 1967-72 $\frac{1}{2}$ , 1973-78	03-24-78	17.71	1,020
04164400	Deer Creek near Meade, MI	Lat 42°42'39", long 82°51'32", in NW $\frac{1}{4}$ sec.6, T.3 N., R.14 E., Macomb County, at bridge on 25 $\frac{1}{2}$ Mile Road, 0.9 mile southeast of Meade.	12.7	1959-60, 1961-65 $\frac{1}{2}$ , 1966-78	03-22-78	6.81	404
04164450	McBride Drain near Macomb, MI	Lat 42°41'14", long 82°55'14", in NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec.16, T.3 N., R.13 E., Macomb County, at bridge on 24 Mile Road, 2.2 miles southeast of Macomb.	5.79	1960-64 $\frac{1}{2}$ , 1965-78	03-22-78	8.87	all 10
04164600	Middle Branch Clinton River near Macomb, MI	Lat 42°42'03", long 82°59'44", in SE $\frac{1}{4}$ sec.2, T.3 N., R.12 E., Macomb County, at bridge on Schoenherr Road, 2.0 miles west of Macomb.	22.2	1959-64, 1965-69 $\frac{1}{2}$ , 1971-78	03-21-78	8.18	324
04165200	Gloede Ditch near Waldenburg, MI	Lat 42°37'39", long 82°57'10", in SW $\frac{1}{4}$ sec.32, T.3 N., R.13 E., Macomb County, 2.2 miles south of Waldenburg.	16.0	1959, 1960-64 $\frac{1}{2}$ , 1965-78	03-21-78	14.95	210
Streams tributary to Detroit River							
04167000	Middle River Rouge near Garden City, MI	Lat 42°20'55", long 83°18'45", in SW $\frac{1}{4}$ NW $\frac{1}{4}$ sec.6, T.2 S., R.10 E., Wayne County, on right bank 200 ft downstream from bridge on Inkster Road, 1.8 mi northeast of Garden City.	99.9	1930-33, 1947-78	05-31-78	18.20	790
04168660	Frank and Poet Drain at Trenton, MI	Lat 42°09'19", long 83°12'22", in NW $\frac{1}{4}$ sec.13, T.4 S., R.10 E., Wayne County, at bridge on King Road, at Trenton.	19.3	1972-78	03-21-78	8.46	310
Streams tributary to Lake Erie							
04168800	Huron River near Andersonville, MI	Lat 42°41'35", long 82°29'56", in NW $\frac{1}{4}$ SE $\frac{1}{4}$ sec.3, T.3 N., R.8 E., Oakland County, on downstream side of culvert on White Lake Road, 2.5 miles south of Andersonville.	14.0	1974-78	03-22-78	2.02	62
04169500	Huron River at Commerce, MI	Lat 42°35'25", long 83°29'05", in NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec.10, T.2 N., R.8 E., Oakland County, on downstream left abutment of bridge on Commerce Road, 10 feet upstream from Hayes Creek, and 0.2 miles east of Commerce.	57.3	1946-75 $\frac{1}{2}$ , 1976-78	--	<2.03	<100

See footnotes at end of the table

## DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

407

Annual maximum discharge at crest-stage partial-record stations during water year 1978--Continued

Station No.	Station name	Location	Drainage area (mi <sup>2</sup> )	Period of record	Date	Annual maximum Gage height (feet)	Dis- charge (ft <sup>3</sup> /s)
Streams tributary to Lake Erie--Continued							
04172500	Portage River near Pinckney, MI	Lat 42°25'40", long 83°57'35", in SW $\frac{1}{4}$ sec.34, T.1 N., R.4 E., Livingston County, at bridge on Tiplady Road, 2.0 miles upstream from Little Portage Lake, and 2.2 miles south- west of Pinckney.	79.1	1945-71†, 1972-78	03-28-78	4.07	207
04173000	Huron River near Dexter, MI	Lat 42°23'10", long 83°54'40", in S $\frac{1}{2}$ sec.13, T.1 S., R.4 E., Washtenaw County on right bank 20 ft downstream from bridge on North Territorial Road, 2.0 miles downstream from Portage Lake Outlet and 4.0 miles north of Dexter.	522	1946-72‡, 1973-75, 1976-77‡, 1978	03-23-78	5.43	1,460
04173250	Mill Creek near Lima Center, MI	Lat 42°15'56", long 83°56'45", in NE $\frac{1}{4}$ sec.34, T.2 S., R.4 E., Washtenaw County, at Guenther Road, 2.0 miles upstream from North Fork Mill Creek, and 2.2 miles south of Lima Center.	47.3	1973-78	03-22-78	9.25	480
04176400	Saline River near Saline, MI	Lat 42°07'50", long 83°46'35", in SW $\frac{1}{4}$ sec.18, T.4 S., R.5 E., Washtenaw County, on right bank 20 ft downstream from bridge on Maple Road, 2.8 miles south of Saline.	94.6	1966-77‡, 1978	03-22-78	11.11	1,370

‡ Operated as a continuous-record gaging station.

\* Also a low-flow partial-record station.

&lt; Less than.

a Computed on basis of correlation with nearby stations.

b Maximum gage height, 5.10 ft Apr. 19, 1978, backwater from ice.

c Maximum gage height, 9.46 ft Mar. 22, 1978, backwater from ice.

d Approximately.

e Maximum stage not determined.

f Revised.

g Backwater from ice.

h Maximum gage height, 7.87 ft Mar. 23, 1978, backwater from ice.

i Maximum gage height, 3.90 ft Mar. 22, 1978, backwater from ice.

j Maximum gage height, 6.70 ft Mar. 22, 1978, backwater from ice.

k Maximum gage height, 7.76 ft Mar. 21, 1978, backwater from ice.

m Maximum gage height recorded.



## DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

Measurements of streamflow at points other than gaging stations or partial-record stations are given in the following table. Those that are measurements of base flow are designated by an asterisk(\*).

## DISCHARGE MEASUREMENTS MADE AT MISCELLANEOUS SITES DURING WATER YEAR 1978

Stream	Tributary to	Location	Drainage area (mi <sup>2</sup> )	Measured previously (water years)	Date	Measurements Discharge (ft <sup>3</sup> /s)
Streams tributary to Lake Superior						
Plymouth Mine Pond Outlet	Alward Creek	Lat 46°28'14", long 89°58'56", in SE¼ NW¼ sec.18, T.47 N., R.45 W., Gogebic County, at culvert on Plymouth Road, at Ramsay, MI.	-	1974-77	03-15-78 06-14-78	*.85 1.10
Streams tributary to Lake Michigan						
Iron River	Menominee River	Lat 46°07'34", long 88°41'22", in SE¼ NW¼ sec.16, T.43 N., R.35 W., Iron County, 0.6 mile upstream from Iron Lake Creek, 3.0 miles northwest of Iron River, MI.	-	1946-48	08-08-78	*24.5
Sunset Creek	Iron River	Lat 46°06'27", long 88°39'55", in NW¼ SE¼ sec.22, T.43 N., R.35 W., Iron County, at bridge on county road immediately above unnamed tributary, 1.0 mile northwest of Iron River, MI.	-	-	08-08-78	*.89
Stanley Creek	do	Lat 46°05'35", long 88°40'22", in W¼ sec.27, T.43 N., R.35 W., Iron County, at U.S. Highway 2, 1.0 mile west of Iron River, MI.	a5	1946-48	08-08-78	*8.43
Dober Mine Pond Outlet	do	Lat 46°02'08", long 88°38'08", in NW¼ NW¼ sec.1, T.42 N., R.35 W., Iron County, at mouth, at Stambaugh, MI.	-	1973-76	03-16-78	*.02
Skunk Creek	East Branch Sturgeon River	Lat 46°01'51", long 87°49'46", in SE¼ SE¼ sec.17, T.42 N., R.28 W., Dickenson County, 0.3 mile upstream from mouth, 2.2 miles north of Felch, MI.	14.5	1973-76	08-24-78	113
Mill Creek	Paw Paw River	Lat 42°11'13", long 86°15'28", in SW¼ SW¼ sec.23, T.3 S., R.17 W., Berrien County, at Red Arrow Highway, 0.5 mile south of Watervliet, MI.	-	-	02-09-78	*b31.6
Paw Paw River	St. Joseph River	Lat 42°11'38", long 86°15'31", in SW¼ NW¼ sec.23, T.3 S., R.17 W., Berrien County, at Watervliet, MI.	-	-	02-09-78	*b359
Minges Creek	Kalamazoo River	Lat 42°16'05", long 85°13'14", in SE¼ sec. 27, T.2 S., R.8 W., Calhoun County, 3 miles south of Battle Creek, MI.	-	1949-54	03-11-78	b5.27
Comstock Creek	do	Lat 42°19'58", long 85°27'02", in NW¼ sec.2, T.2 S., R.10 W., Kalamazoo County, at culvert on G Avenue, 4.0 miles northeast of Comstock, MI.	-	1977	08-21-78	*1.13
do	do	Lat 42°19'03", long 85°29'08", in NW¼ sec.9, T.2 S., R.10 W., Kalamazoo County, at culvert on H Avenue, 2.8 miles northeast of Comstock, MI.	14.8	1969, 1976-77	08-21-78	*5.57
Grand River	Lake Michigan	Lat 42°10'08", long 84°23'02", in SE¼ NE¼ sec.35, T.3 S., R.1 W., Jackson County, at bridge on Draper Road, 2.0 miles south of Vandercook, MI.	41.0	1961, 1963-65c, 1974-77	04-05-78	b95.7
Portage River	Grand River	Lat 42°19'17", long 84°20'19", in SW¼ SE¼ sec.5, T.2 S., R.1 E., Jackson County, at bridge on Hawkins Road, 6.5 miles northeast of Jackson, MI.	-	1977	10-06-77	*b33.6
Tupper Creek	Little Thornapple River	Lat 42°47'37", long 85°06'50", in SW¼ NW¼ sec.26, T.5 N., R.7 W., Ionia County, at Ainsworth Road, 1.0 mile northeast of Lake Odessa, MI.	-	-	10-04-77	*1.16
Black Creek	Lake Michigan	Lat 43°12'56", long 86°05'42", in SE¼ NE¼ sec.33, T.10 N., R.15 W., Muskegon County, at Evanston Road, 2.4 miles southeast of Wolf Lake, MI.	-	-	10-17-77	*b34.0
Unnamed tributary	Black Creek	Lat 43°11'15", long 86°12'15", in NW¼ NW¼ sec.10, T.9 N., R.16 W., Muskegon County, 1.5 miles south of Muskegon Heights, MI.	-	-	10-17-77	*bd1.2
Black Creek	Lake Michigan	Lat 43°11'15", long 86°12'16", in NW¼ NW¼ sec.10, T.9 N., R.16 W., Muskegon County, 1.5 miles south of Muskegon Heights, MI.	-	-	10-17-77	*b54.8

See footnotes at end of the table

## DISCHARGE MEASUREMENTS MADE AT MISCELLANEOUS SITES DURING WATER YEAR 1978--CONTINUED

Stream	Tributary to	Location	Drainage area (mi <sup>2</sup> )	Measured previously (water years)	Measurements	
					Date	Discharge (ft <sup>3</sup> /s)
Streams tributary to Lake Michigan--Continued						
Brooks Creek	Muskegon River	Lat 43°26'31", long 85°48'22", in SW¼ NE¼ sec.24, T.12 N., R.13 W., Newaygo County, at bridge on State Highway 37, in Newaygo, MI.	-	-	07-31-78	*b4.98
Muskegon River	Lake Michigan	Lat 43°20'50", long 85°56'22", in SE¼ NE¼ sec.14, T.11 N., R.14 W., Newaygo County, at bridge on Warner Road, in Bridgeton, MI.	-	-	10-12-77 11-15-77 04-11-78 05-24-78	1,040 2,370 5,990 *2,040
Little Bear Creek	Bear Creek	Lat 43°18'05", long 85°14'10", in SW¼ SE¼ sec.32, T.11 N., R.16 W., Muskegon County, 15 ft up-stream from confluence with unnamed tributary, in Barry Junction, MI.	-	-	08-08-78	*b.80
Unnamed tributary	Little Bear Creek	Lat 43°18'05", long 86°14'12", in SW¼ SE¼ sec.32, T.11 N., R.16 W., Muskegon County, 15 ft below dam, in Barry Junction, MI.	-	-	08-08-78	*b.18
Little Bear Creek	Bear Creek	Lat 43°17'45", long 86°14'40", in SE¼ sec.32, T.11 N., R.16 W., Muskegon County, at bridge on River Road, in Barry Junction, MI.	-	-	08-08-78	*b4.62
Jordan River	Lake Charlevoix	Lat 45°02'10", long 84°58'06", in NW¼ SE¼ sec.31, T.31 N., R.5 W., Antrim County, at bridge on Jordan River Road, 4.0 miles north of Alba, MI.	-	1977	10-04-77 11-01-77 12-13-77 01-03-78 02-06-78	*b45.7 *b45.5 *b46.6 *b45.8 *b38.9
do	do	Lat 45°00'51", long 85°01'44", in NE¼ NE¼ sec.9, T.30 N., R.6 W., Antrim County, at Pinney Bridge, 4.0 miles northwest of Alba, MI.	29.6	1968, 1971, 1977	10-04-77 11-01-77 02-06-78	*b111 *b114 *b106
do	do	Lat 45°07'58", long 85°07'28", in NE¼ NE¼ sec.35, T.32 N., R.7 W., Charlevoix County, at Rogers Bridge, 1.5 miles south of East Jordan, MI.	-	1977	10-04-77 11-01-77 12-13-77 01-04-78	*b179 *b179 *b193 *b187
Brown Creek	do	Lat 45°09'10", long 85°07'16", in NE¼ SE¼ sec.23, T.32 N., R.7 W., Charlevoix County, at bridge on State Highway 32, in East Jordan, MI.	-	1977	10-04-77 11-01-77 12-14-77 01-04-78 02-07-78	*b2.32 *b3.03 *b2.85 *b2.46 *b1.87
Monroe Creek	do	Lat 45°10'44", long 85°09'51", in SE¼ SE¼ sec.9, T.32 N., R.7 W., Charlevoix County, at culvert on State Highway 66, 2.5 miles northwest of East Jordan, MI.	9.73	1973, 1977	10-05-77 01-04-78	b12.9 *b12.3
Boyne River	do	Lat 45°11'48", long 84°57'26", in NW¼ SW¼ sec.5, T.32 N., R.5 W., Charlevoix County, at culvert on Dam Road, 0.3 mile downstream from non-operative hydroelectric plant, 2.8 miles south-east of Boyne City, MI.	a65	1973 1974-78e	10-03-77 11-01-77 12-13-77 01-04-78 02-06-78 04-11-78 06-21-78 07-24-78 08-21-78	*b78.1 *b85.1 *b90.2 *b91.6 *b74.6 229 *76.5 84.4 *75.3
Porter Creek	do	Lat 45°13'06", long 85°04'22", in NW¼ NW¼ sec.32, T.33 N., R.6 W., Charlevoix County, at culvert on county road, at Advance, MI.	17.4	1973, 1977	10-03-77 11-01-77 12-13-77 01-04-78 02-07-78	*b16.0 *b15.6 *b17.4 *b17.4 *b15.3
Horton Creek	do	Lat 45°17'19", long 85°05'11", in NW¼ NE¼ sec.6, T.33 N., R.6 W., Charlevoix County, at culvert on county road, 0.5 mile north of Horton Bay, MI.	11.8	1973, 1977	10-04-77	*b18.3
Strover Creek	do	Lat 45°18'02", long 85°14'59", in NW¼ SE¼ sec.35, T.34 N., R.8 W., Charlevoix County, 100 ft upstream from mouth, and 1.0 mile south of Charlevoix, MI.	-	1977	10-05-77 11-02-77 12-13-77 01-04-78 02-07-78	b3.22 b4.02 *b4.00 *b4.54 *b2.75
Streams tributary to Lake Huron						
Van Etten Creek	Au Sable River	Lat 44°26'49", long 83°20'21", in SW¼ NW¼ sec.27, T.24 N., R.9 E., Iosco County, at Detroit and Mackinac Railroad Bridge, 2.0 miles northwest of Oscoda, MI.	-	1973-77	12-29-77	*b59.0

See footnotes at end of the table

## DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

## DISCHARGE MEASUREMENTS MADE AT MISCELLANEOUS SITES DURING WATER YEAR 1978--CONTINUED

Stream	Tributary to	Location	Drainage area (mi <sup>2</sup> )	Measured previously (water years)	Measurements	
					Date	Discharge (ft <sup>3</sup> /s)
Streams tributary to Lake Huron--Continued						
Shiawassee River	Saginaw River	Lat 42°48'26", long 83°50'24", in NW¼ sec.26, T.5 N., R.5 E., Genesee County, at Seymour Road, 1.0 mile north of Argentine, MI.	-	-	08-15-78	*b10.9
do	do	Lat 42°49'00", long 83°53'43", in NE¼ SW¼ sec.20, T.5 N., R.5 E., Genesee County, at Duffield Road, 2.3 miles east of Byron, MI.	-	1959, 1974	08-15-78	*b28.9
Indian Creek	North Branch Flint River	Lat 43°19'33", long 83°10'10", in SE¼ sec.33, T.11 N., R.11 E., Tuscola County, at Marlette Road, 1.0 mile northeast of Clifford, MI.	-	-	06-19-78	*b.08
do	do	Lat 43°18'29", long 83°09'46", in NE¼ sec.10, T.10 N., R.11 E., Lapeer County, at Clifford Road, 1.0 mile southeast of Clifford, MI.	-	-	06-19-78	*b.59
Flint River	Shiawassee River	Lat 43°01'02", long 83°44'04", T.7 N., R.6 E., Genesee County, at Ballenger Highway, at Flint, MI.	-	-	05-23-78	b616
do	do	Lat 43°02'04", long 83°45'37", in SW¼ SE¼ sec.4, T.7 N., R.6 E., Genesee County, at Mill Road, at Flint, MI.	-	-	08-01-78	b216
do	do	Lat 43°10'34", long 83°52'42", in SE¼ sec.16, T.9 N., R.5 E., Genesee County, at bridge on State Highway 57, 0.7 mile east of Montrose, MI.	-	1977	05-23-78 08-01-78	b618 b185
Brent Run	Flint River	Lat 43°11'13", long 83°51'48", in NW¼ sec.15, T.9 N., R.5 E., Genesee County, at McKinley Road, 2.0 miles northeast of Montrose, MI.	-	1963, 1974	05-23-78 08-01-78	b10.7 *b2.67
Pine Run	do	Lat 43°15'05", long 83°51'15", in SE¼ SE¼ sec.22, T.10 N., R.5 E., Saginaw County, at Marshall Road, 3.0 miles west of Birch Run, MI.	-	-	05-23-78	b8.89
Silver Creek	do	Lat 43°15'40", long 83°48'53", in NE¼ sec.24, T.10 N., R.5 E., Saginaw County, at Elms Road, 0.5 mile northwest of Birch Run, MI.	-	-	04-26-78 05-23-78	b3.44 b3.62
do	do	Lat 43°16'27", long 83°52'27", in SW¼ NW¼ sec.15, T.10 N., R.5 E., Saginaw County, at Pettit Road, 4.3 miles northwest of Birch Run, MI.	-	-	05-23-78	b5.73
Pinnebog River	Lake Huron	Lat 43°55'14", long 83°07'32", in NE¼ NE¼ sec.12, T.17 N., R.11 E., Huron County, at bridge on Limerick Road, 1.5 miles southwest of Pinnebog, MI.	-	1973-77	11-30-77 06-19-78	*b92.5 b122
Streams tributary to Lake Erie						
Huron River	Lake Erie	Lat 42°40'11", long 83°29'19", in NE¼ NE¼ sec.15, T.3 N., R.8 E., Oakland County, at bridge on Teggerdine Road, 0.2 mile west of west end of Pontiac Lake.	-	1977	10-11-77 11-09-77 12-06-77 01-10-78 02-13-78 03-13-78 04-10-78	b5.10 b5.63 b6.79 b5.96 b5.94 b7.09 b16.7
do	do	Lat 42°38'10", long 83°28'16", in NW¼ sec.26, T.3 N., R.8 E., Oakland County, at bridge on Avon Lea Road, 0.2 mile south of Oxbow Lake.	-	1977	12-06-77 01-10-78 02-13-78 03-13-78 04-10-78	b10.6 b14.1 b15.6 b11.8 b54.5
do	do	Lat 42°38'03", long 83°29'16", in NW¼ SE¼ sec.27, T.3 N., R.8 E., Oakland County, at bridge on Oxbow Lake Road, 0.5 mile south of Union Lake Road, 1.0 mile southwest of Oxbow, MI.	27.6	1966-67, 1969-70, 1977	10-11-77 12-06-77 01-11-78 02-13-78 03-13-78 04-10-78	b9.45 b15.4 b18.6 b20.7 b15.5 b54.5
do	do	Lat 42°34'08", long 83°30'15", in SE¼ sec.16, T.2 N., R.8 E., Oakland County, at bridge on Benstein Road, at Commerce Lake Outlet, 3.5 miles northeast of Wixom, MI.	-	1977	10-12-77 11-08-77 12-06-77 01-11-78 02-14-78 03-13-78 04-10-78	b27.7 b46.8 b42.4 b39.4 b43.6 b36.7 b98.7

See footnotes at end of the table

## DISCHARGE MEASUREMENTS MADE AT MISCELLANEOUS SITES DURING WATER YEAR 1978--CONTINUED

Stream	Tributary to	Location	Drainage area (mi <sup>2</sup> )	Measured previously (water years)	Measurements	
					Date	Discharge (ft <sup>3</sup> /s)
Streams tributary to Lake Erie--Continued						
Norton Creek	Huron River	Lat 42°32'36", long 83°33'02", in NE¼ SW¼ sec.30, T.2 N., R.8 E., Oakland County, south of Charms Road, below the Wixom Waste Water Treatment Plant, 1.5 miles northwest of Wixom, MI.	-	1977	10-12-77	b5.60
					11-08-77	b5.04
					12-06-77	b6.26
					01-11-78	b4.91
					02-14-78	b6.66
					03-13-78	b7.91
		04-10-78	b12.9			
Pettibone Creek	do	Lat 42°35'21", long 83°36'08", in SE¼ NE¼ sec.10, T.2 N., R.7 E., Oakland County, below old power-house in Milford, MI.	-	1977	10-12-77	b10.0
					11-08-77	b8.18
					12-06-77	b12.2
					01-11-78	b10.2
					02-14-78	b11.9
					03-14-78	b13.0
		04-10-78	b22.2			
Davis Creek	do	Lat 42°27'23", long 83°44'24", in NW¼ sec.28, T.1 N., R.6 E., Livingston County, at bridge on Fairlane Road (formerly Spicer Road), 1.8 miles west of South Lyon, MI.	-	1977	02-14-78	b23.9
					04-11-78	b114
Woodland Lake Outlet	South Ore Creek	Lat 42°32'38", long 83°46'54", in NW¼ NE¼ sec.30, T.2 N., R.6 E., Livingston County, at bridge on I-96, 1.0 mile north of Brighton, MI.	-	1977	04-11-78	b35.9
do	do	Lat 42°31'42", long 83°46'54", in NE¼ NW¼ sec.31, T.2 N., R.6 E., Livingston County, below the Mill Pond in Brighton, MI.	-	1977	10-12-77	b11.1
					11-08-77	b8.81
					12-05-77	b16.0
					02-14-78	b11.7
					03-14-78	b16.0
					04-11-78	b36.6
Brighton Lake Outlet	do	Lat 42°31'01", long 83°48'09", in SE¼ SW¼ sec.36, T.2 N., R.6 E., Livingston County, below the outlet structure of Brighton Lake at the Charles Howell Scout Reservation, 1.0 mile southwest of Brighton, MI.	-	1977	04-11-78	b40.4
					08-23-78	*b2.65
South Ore Creek	Huron River	Lat 42°29'52", long 83°48'09", in NW¼ sec.12, T.1 N., R.5 E., Livingston County, at bridge on Hamburg Road, 2.5 miles southwest of Brighton, MI.	33.7	1951-68f, 1970-71, 1977	08-23-78	*b5.27
Ore Lake Outlet	do	Lat 42°28'23", long 83°47'49", in SW¼ SE¼ sec.13, T.1 N., R.5 E., Livingston County, at Ore Lake Outlet, 1.5 miles north of Hamburg, MI.	-	1977	10-12-77	b15.9
					11-08-77	b27.1
					12-05-77	b39.2
					02-14-78	b29.0
					03-14-78	b15.2
					04-11-78	b59.3
Horseshoe Lake Outlet	do	Lat 42°27'11", long 83°49'17", in NW¼ sec.26, T.1 N., R.5 E., Livingston County, at bridge on Merrill Road, 1.0 mile west of Hamburg, MI.	30.7	1970-71, 1977	01-11-78	b7.45
					03-14-78	b11.1
					04-11-78	b37.8
Portage Lake Outlet	do	Lat 42°24'55", long 83°54'20", in SE¼ SE¼ sec.1, T.1 S., R.4 E., Washtenaw County, at the DNR access site, at bridge on McGregor Road, 1.0 mile northwest of Dover, MI.	-	1977	11-08-77	b160
					12-05-77	b114
					01-11-78	b64.3
					02-14-78	b43.3
					03-14-78	b23.8
					04-11-78	b313
Bean Creek	Tiffin River	Lat 41°58'40", long 84°21'18", in NW¼ SE¼ sec.6, T.6 S., R.1 E., Lenawee County, on U.S. Highway 127, at Addison, MI.	44.9	1962, 1967	06-06-78	*11.3
St. Joseph Creek	Bean Creek	Lat 41°53'01", long 84°21'36", in NW¼ NW¼ sec.7, T.7 S., R.1 E., Lenawee County, on Beecher Road, 2.0 miles north of Hudson, MI.	-	-	06-06-78	*5.12

\* Base flow.

a Approximately.

b Discharge measurement made by employees of Michigan Department of Natural Resources.

c Operated as a low-flow partial-record station.

d Field estimate.

e Operated as a crest-stage partial-record station.

f Operated as a continuous-record gaging station.

Samples are collected at sites other than gaging stations and partial-record stations to give better areal coverage in a river basin. Such sites are referred to as miscellaneous sites.

## WATER QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

## STREAMS TRIBUTARY TO LAKE MICHIGAN

455907086185401 INDIAN LAKE, SITE 1, NEAR MANISTIQUE, MI (LAT 45 59 07 LONG 086 18 54)

## WATER QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DATE	TIME	SAMP- LING DEPTH (FT)	RESER- VOIR DEPTH (FEET)	STREAM STAGE (FT ABOVE DATUM)	SPE- CIFIC CON- DUCT- ANCE (MICRO- MHOS)	PH (UNITS)	TEMPER- ATURE, AIR (DEG C)	TEMPER- ATURE (DEG C)	COLOR (PLAT- INUM- COBALT UNITS)	TRANS- PAR- ENCY (SECCHI DISK) (IN)	COLI- FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML)
OCT 04...	1515	3.0	15	4.52	263	7.9	17.5	12.5	8	66	<1
NOV 01...	1216	3.0	14	4.02	283	8.2	11.0	8.5	35	62	<1
JAN 05...	1500	3.0	15	4.24	216	7.9	-5.5	.5	45	96	<1
MAR 07...	1330	3.0	15	3.55	192	7.5	-1.0	1.0	40	36	<1
MAY 24...	1215	3.0	16	5.09	204	8.3	17.5	16.5	40	85	<1
JUN 28...	1200	3.0	16	4.66	223	8.2	25.5	22.0	30	90	<1
AUG 09...	1045	3.0	15	4.62	262	8.2	19.5	21.0	--	66	<1
SEP 27...	0909	3.0	16	--	224	8.0	13.5	13.5	--	30	<1

DATE	STREP- TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML)	HARD- NESS (MG/L AS CACO3)	HARD- NESS, NONCAR- BONATE (MG/L CACO3)	CALCIUM DIS- SOLVED (MG/L AS CA)	MAGNE- SIUM, DIS- SOLVED (MG/L AS MG)	SODIUM, DIS- SOLVED (MG/L AS NA)	SODIUM PERCENT	SODIUM AD- SORP- TION RATIO	POTAS- SIUM, DIS- SOLVED (MG/L AS K)	BICAR- BONATE (MG/L AS HCO3)	CAR- BONATE (MG/L AS CO3)
OCT 04...	<1	130	61	41	7.4	1.2	2	.0	.9	88	0
NOV 01...	K1100	130	64	42	6.9	1.1	2	.0	.9	84	0
JAN 05...	<1	110	37	32	6.4	1.4	3	.1	.9	84	0
MAR 07...	<1	100	25	29	6.7	1.2	3	.1	.9	92	0
MAY 24...	K2	100	47	31	5.4	.8	2	.0	.7	64	0
JUN 28...	K5	120	54	36	6.3	1.1	2	.0	.7	76	0
AUG 09...	44	130	53	40	7.0	1.1	2	.0	.9	--	--
SEP 27...	<1	120	--	35	6.9	1.2	2	.0	.6	--	--

DATE	ALKA- LINITY (MG/L AS CACO3)	CARBON DIOXIDE DIS- SOLVED (MG/L AS CO2)	SULFATE DIS- SOLVED (MG/L AS SO4)	CHLO- RIDE, DIS- SOLVED (MG/L AS CL)	FLUO- RIDE, DIS- SOLVED (MG/L AS F)	SILICA, DIS- SOLVED (MG/L AS SiO2)	SOLIDS, RESIDUE AT 180 DEG. C DIS- SOLVED (MG/L)	SOLIDS, SUM OF CONSTITU- ENTS, DIS- SOLVED (MG/L)	SOLIDS, DIS- SOLVED (TONS PER AC-FT)	NITRO- GEN, NITRATE TOTAL (MG/L AS N)	NITRO- GEN, NITRITE TOTAL (MG/L AS N)
OCT 04...	72	1.8	56	1.6	.0	5.8	158	157	.21	.01	.00
NOV 01...	69	.8	55	2.2	.1	6.1	175	156	.24	.02	.00
JAN 05...	69	1.7	31	1.5	.0	7.5	142	122	.19	.16	.00
MAR 07...	75	4.7	24	.8	.1	9.4	134	118	.18	.16	.01
MAY 24...	53	.5	44	3.3	.0	3.2	150	120	.20	.00	.00
JUN 28...	62	.8	48	2.1	.0	2.4	166	134	.23	.00	.00
AUG 09...	76	--	48	1.8	.1	4.7	194	149	.26	.00	.00
SEP 27...	68	--	38	1.4	.1	6.6	160	--	.22	.03	.00

K--BASED ON COLONY COUNT OUTSIDE THE ACCEPTABLE RANGE (NON-IDEAL COLONY COUNT)



## WATER QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

## STREAMS TRIBUTARY TO LAKE MICHIGAN--CONTINUED

455907086185401 INDIAN LAKE, SITE 1, NEAR MANISTIQUE, MI (LAT 45 59 07 LONG 086 18 54)--CONTINUED

## WATER QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DATE	NITRO- GEN, NO2+NO3 TOTAL (MG/L AS N)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N)	NITRO- GEN, ORGANIC TOTAL (MG/L AS N)	NITRO- GEN+AM- MONIA + ORGANIC TOTAL (MG/L AS N)	NITRO- GEN, TOTAL (MG/L AS N)	NITRO- GEN, TOTAL (MG/L AS NO3)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, ORTHOPHOS- PHATE TOTAL (MG/L AS P)	IRON, DIS- SOLVED (UG/L AS FE)	MANGA- NESE, DIS- SOLVED (UG/L AS MN)	CARBON, ORGANIC TOTAL (MG/L AS C)
OCT 04...	.01	.01	.30	.31	.32	1.4	.00	.01	50	0	11
NOV 01...	.02	.01	.36	.37	.39	1.7	.02	.00	180	0	--
JAN 05...	.16	.05	.48	.53	.69	3.1	.01	.00	210	10	7.9
MAR 07...	.17	.01	.15	.16	.33	1.5	.00	.00	270	30	8.2
MAY 24...	.00	.01	.38	.39	.39	1.7	.04	.00	90	0	8.5
JUN 28...	.00	.00	.24	.24	.24	1.1	.01	.00	10	10	4.8
AUG 09...	.00	.01	.82	.83	.83	3.7	.03	.00	50	0	7.6
SEP 27...	.03	.03	.21	.24	.27	1.2	.02	.00	520	0	8.6

DATE	PHENOLS (UG/L)	PHYTO- PLANK- TON, TOTAL (CELLS PER ML)	SESTON, TOTAL (MG/L)	SESTON ASH WEIGHT (MG/L)	CHLORO- PHYLL A PHYTO- PLANK- TON, UNCORR. (UG/L)	CHLORO- PHYLL B PHYTO- PLANK- TON, UNCORR. (UG/L)	ALGAL GROWTH POTEN- TIAL, BOTTLE TEST (MG/L)	LENGTH OF EXPO- SURE (DAYS)	PERI- PHYTON BIOMASS ASH WEIGHT G/SQ M	PERI- PHYTON BIOMASS TOTAL DRY WEIGHT G/SQ M
OCT 04...	0	220000	78	472	5.43	.000	15	--	--	--
NOV 01...	--	69000	--	--	2.05	.000	.2	--	--	--
JAN 05...	--	68	--	--	--	--	2.8	--	--	--
MAR 07...	--	19	--	--	--	--	2.3	--	--	--
MAY 24...	--	9000	6.0	2.0	--	--	3.1	--	--	--
JUN 28...	--	120000	4.0	4.0	--	--	.8	--	--	--
AUG 09...	--	25000	6.0	3.0	--	--	.4	42	.394	.551
SEP 27...	--	--	--	--	--	--	--	--	--	--

DATE	TIME	ARSENIC TOTAL (UG/L AS AS)	BARIUM, TOTAL RECOV- ERABLE (UG/L AS BA)	CADMIUM TOTAL RECOV- ERABLE (UG/L AS CD)	CHRO- MIUM, TOTAL RECOV- ERABLE (UG/L AS CR)	COBALT, TOTAL RECOV- ERABLE (UG/L AS CO)	COPPER, TOTAL RECOV- ERABLE (UG/L AS CU)	IRON, TOTAL RECOV- ERABLE (UG/L AS FE)
OCT 04...	1515	1	0	0	<10	0	5	130

DATE	IRON, DIS- SOLVED (UG/L AS FE)	LEAD, TOTAL RECOV- ERABLE (UG/L AS PB)	MANGA- NESE, TOTAL RECOV- ERABLE (UG/L AS MN)	MANGA- NESE, DIS- SOLVED (UG/L AS MN)	MERCURY TOTAL RECOV- ERABLE (UG/L AS HG)	NICKEL, TOTAL RECOV- ERABLE (UG/L AS NI)	ZINC, TOTAL RECOV- ERABLE (UG/L AS ZN)
OCT 04...	50	10	20	0	<.5	5	10

## WATER QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

## STREAMS TRIBUTARY TO LAKE MICHIGAN--CONTINUED

455907086185401 INDIAN LAKE, SITE 1, NEAR MANISTIQUE, MI (LAT 45 59 07 LONG 086 18 54)--CONTINUED

## WATER QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DATE	TIME	SAMP- LING DEPTH (FT)	SPE- CIFIC CON- DUCT- ANCE (MICRO- MHOS)	PH (UNITS)	TEMPER- ATURE (DEG C)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION)
OCT							
04...	1514	1.0	--	--	12.5	10.6	100
04...	1516	4.0	--	--	12.5	10.4	98
04...	1517	6.0	--	--	12.0	10.6	99
04...	1518	8.0	264	7.9	12.0	10.3	96
04...	1519	10	--	--	12.0	10.2	95
04...	1520	12	--	--	12.0	10.2	95
04...	1521	14	263	8.0	11.5	9.7	90
04...	1522	15	--	--	11.5	9.7	90
NOV							
01...	1215	1.0	--	--	8.5	11.6	100
01...	1217	4.0	--	--	8.5	11.6	100
01...	1218	6.0	--	--	8.5	11.6	100
01...	1219	8.0	283	8.2	8.5	11.4	102
01...	1220	10	--	--	8.5	11.7	101
01...	1221	12	--	--	8.5	11.7	101
01...	1222	14	298	8.1	8.5	11.0	95
JAN							
05...	1459	1.0	--	--	.0	12.6	89
05...	1501	4.0	--	--	.5	12.8	90
05...	1502	6.0	--	--	1.5	12.6	91
05...	1503	8.0	291	7.8	2.5	9.2	68
05...	1504	10	--	--	3.0	6.0	45
05...	1505	12	--	--	3.5	4.8	37
05...	1506	14	722	7.4	4.0	3.0	23
05...	1507	15	--	--	4.0	2.8	22
MAR							
07...	1331	4.0	--	--	1.0	8.6	62
07...	1332	6.0	--	--	2.0	6.2	46
07...	1333	8.0	344	7.8	4.0	5.2	41
07...	1334	10	--	--	3.5	5.6	43
07...	1335	12	--	--	3.5	5.6	43
07...	1336	14	894	7.8	4.0	4.4	38
07...	1337	15	--	--	3.5	4.6	35
MAY							
24...	1214	1.0	--	--	16.5	10.3	107
24...	1216	4.0	--	--	16.5	10.2	106
24...	1217	6.0	--	--	15.5	10.2	103
24...	1218	8.0	214	8.3	15.0	10.2	103
24...	1219	10	--	--	15.0	10.2	103
24...	1220	12	--	--	14.5	9.2	92
24...	1221	14	216	8.1	14.5	9.2	92
JUN							
28...	1159	1.0	--	--	22.5	8.5	100
28...	1201	4.0	--	--	22.0	8.6	100
28...	1202	6.0	--	--	21.5	8.7	100
28...	1203	8.0	225	8.2	21.5	8.6	99
28...	1204	10	--	--	21.5	8.6	99
28...	1205	12	--	--	21.0	8.4	95
28...	1206	14	226	8.2	21.0	8.4	95
28...	1207	16	--	--	21.0	8.0	91
AUG							
09...	1044	1.0	--	--	21.0	8.4	97
09...	1046	4.0	--	--	21.0	8.4	97
09...	1047	6.0	--	--	21.0	8.4	97
09...	1048	8.0	256	8.2	21.0	8.4	97
09...	1049	10	--	--	21.0	8.4	97
09...	1050	12	--	--	21.0	8.4	97
09...	1051	14	253	8.2	20.5	8.5	97
09...	1052	15	--	--	20.5	8.4	95
SEP							
27...	0908	1.0	--	--	13.5	9.6	94
27...	0910	4.0	--	--	13.5	9.6	94
27...	0911	6.0	--	--	13.5	9.6	94
27...	0912	8.0	224	8.0	13.5	9.5	93
27...	0913	10	--	--	13.5	9.5	93
27...	0914	12	--	--	13.5	9.5	93
27...	0915	14	224	8.0	13.5	9.5	93
27...	0916	15	--	--	13.5	9.4	92

## WATER QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

## STREAMS TRIBUTARY TO LAKE MICHIGAN--CONTINUED

455724086203801 INDIAN LAKE, SITE 2, NEAR MANISTIQUE, MI (LAT 45 57 24 LONG 086 20 38)

## WATER QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DATE	TIME	SAMP- LING DEPTH (FT)	RESER- VOIR DEPTH (FEET)	STREAM STAGE (FT ABOVE DATUM)	SPE- CIFIC CON- DUCT- ANCE (MICRO- MHOS)	PH (UNITS)	TEMPER- ATURE, AIR (DEG C)	TEMPER- ATURE (DEG C)	TRANS- PAR- ENCY (SECCHI DISK) (IN)
OCT 04...	1646	3.0	14	4.52	274	8.0	17.0	12.5	60
NOV 01...	1501	3.0	14	4.05	272	8.2	11.0	9.0	78
JAN 05...	1035	3.0	15	4.24	259	7.8	-5.5	1.0	114
MAR 07...	1000	3.0	15	3.55	230	7.7	1.0	1.0	54
JUN 28...	1500	3.0	15	4.66	228	8.2	26.0	22.0	72
AUG 09...	1320	3.0	15	4.62	264	8.2	24.5	20.5	64
SEP 27...	1155	3.0	15	--	243	7.8	14.5	13.5	36

DATE	NITRO- GEN, NITRATE TOTAL (MG/L AS N)	NITRO- GEN, NITRITE TOTAL (MG/L AS N)	NITRO- GEN, NO2+NO3 TOTAL (MG/L AS N)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N)	NITRO- GEN, ORGANIC TOTAL (MG/L AS N)	NITRO- GEN,AM- MONIA + ORGANIC TOTAL (MG/L AS N)	NITRO- GEN, TOTAL (MG/L AS N)	NITRO- GEN, TOTAL (MG/L AS NO3)	PHOS- PHORUS, TOTAL (MG/L AS P)
OCT 04...	.00	.00	.00	.02	.36	.38	.38	1.7	.00
NOV 01...	.01	.00	.01	.01	.46	.47	.48	2.1	.03
JAN 05...	.11	.00	.11	.02	.34	.36	.47	2.1	.01
MAR 07...	.22	.01	.23	.07	.42	.49	.72	3.2	.01
JUN 28...	--	--	--	--	--	--	--	--	--
AUG 09...	.00	.00	.00	.03	.73	.76	.76	3.4	.02
SEP 27...	.02	.00	.02	.03	.76	.79	.81	3.6	.02

DATE	PHOS- PHORUS, ORTHO. TOTAL (MG/L AS P)	CARBON, ORGANIC TOTAL (MG/L AS C)	PHYTO- PLANK- TON, TOTAL (CELLS PER ML)	SESTON, TOTAL (MG/L)	SESTON ASH WEIGHT (MG/L)	ALGAL GROWTH POTEN- TIAL, BOTTLE TEST (MG/L)	LENGTH OF EXPO- SURE (DAYS)	PERI- PHYTON BIOMASS ASH WEIGHT G/SQ M	PERI- PHYTON BIOMASS TOTAL DRY WEIGHT G/SQ M
OCT 04...	.00	--	160000	--	--	.3	--	--	--
NOV 01...	.00	--	33000	--	--	.4	--	--	--
JAN 05...	.00	8.3	420	--	--	1.6	--	--	--
MAR 07...	.00	9.2	130	--	--	.4	--	--	--
JUN 28...	--	6.7	65000	4.0	4.0	.7	--	--	--
AUG 09...	.00	4.9	190000	6.0	.0	.5	42	.236	.472
SEP 27...	.00	7.2	--	--	--	--	--	--	--

## WATER QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

## STREAMS TRIBUTARY TO LAKE MICHIGAN--CONTINUED

455724086203801 INDIAN LAKE, SITE 2, NEAR MANISTIQUE, MI (LAT 45 57 24 LONG 086 20 38)--CONTINUED

## WATER QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DATE	TIME	SAMP- LING DEPTH (FT)	SPF- CIFIC CON- DUCT- ANCE (MICRO- MHOS)	PH (UNITS)	TEMPER- ATURE (DEG C)	OXYGEN, DIS- SOLVED (MG/L)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION)
OCT							
04...	1645	1.0	--	--	12.5	10.0	94
04...	1647	4.0	--	--	12.2	10.0	93
04...	1648	6.0	--	--	12.0	10.1	94
04...	1649	8.0	274	7.9	12.0	10.0	94
04...	1650	10	--	--	12.0	10.0	94
04...	1651	12	--	--	12.0	9.9	93
04...	1652	14	265	8.0	12.0	9.7	91
NOV							
01...	1500	1.0	--	--	9.0	10.8	94
01...	1502	4.0	--	--	9.0	10.7	93
01...	1503	6.0	--	--	9.0	10.8	94
01...	1504	8.0	268	8.3	8.5	10.8	93
01...	1505	10	--	--	8.5	10.8	93
01...	1506	12	--	--	8.5	10.8	93
01...	1507	14	264	8.3	8.5	10.6	91
JAN							
05...	1034	1.0	--	--	.5	12.5	88
05...	1036	4.0	--	--	1.0	12.5	89
05...	1037	6.0	--	--	2.0	12.3	90
05...	1038	8.0	255	7.9	2.5	11.8	87
05...	1039	10	--	--	3.0	9.9	74
05...	1040	12	--	--	3.5	6.5	49
05...	1041	14	284	7.5	4.0	5.4	42
MAR							
07...	1001	4.0	--	--	2.0	10.1	74
07...	1002	6.0	--	--	4.0	10.1	78
07...	1003	8.0	241	7.6	4.0	8.1	62
07...	1004	10	--	--	4.0	5.0	38
07...	1005	12	--	--	4.0	3.2	25
07...	1006	14	267	7.4	5.0	.6	5
MAY							
24...	1604	1.0	--	--	16.0	10.5	108
24...	1607	4.0	--	--	16.0	10.5	108
24...	1610	6.0	--	--	16.0	10.5	108
24...	1612	8.0	221	8.4	15.5	10.5	107
24...	1615	10	--	--	15.5	10.4	106
24...	1617	12	--	--	15.0	10.0	101
24...	1620	14	222	8.2	14.5	9.4	94
JUN							
28...	1459	1.0	--	--	22.0	8.3	97
28...	1501	4.0	--	--	22.0	8.5	99
28...	1502	6.0	--	--	22.0	8.5	99
28...	1503	8.0	228	8.2	22.0	8.5	99
28...	1504	10	--	--	21.5	8.6	99
28...	1505	12	--	--	21.5	8.4	97
28...	1506	14	229	8.0	21.0	7.8	89
AUG							
09...	1319	1.0	--	--	20.5	8.6	98
09...	1321	4.0	--	--	20.5	8.6	98
09...	1322	6.0	--	--	20.5	8.6	98
09...	1323	8.0	264	8.2	20.5	8.6	98
09...	1324	10	--	--	20.5	8.6	98
09...	1325	12	--	--	20.5	8.6	98
09...	1326	14	266	8.1	20.0	8.4	93
SEP							
27...	1154	1.0	--	--	13.5	9.6	94
27...	1156	4.0	--	--	13.5	9.6	94
27...	1157	6.0	--	--	13.5	9.6	94
27...	1158	8.0	243	7.8	13.5	9.6	94
27...	1159	10	--	--	13.5	9.6	94
27...	1200	12	--	--	14.0	9.6	94
27...	1201	14	243	7.8	14.0	9.6	94

## WATER QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

## STREAMS TRIBUTARY TO LAKE MICHIGAN--CONTINUED

04096435 COLDWATER LAKE NEAR COLDWATER, MI (LAT 41 50 29 LONG 084 58 46)

		DEPTH TO BOT- TOM OF SAMPLE INTER- VAL (FT)	DEPTH TO TOP OF SAMPLE INTER- VAL (FT)	SPE- CIFIC CON- DUCT- ANCE (MICRO- MHOS)	PH  (UNITS)	TEMPER- ATURE (DEG C)	OXYGEN, DIS- SOLVED (MG/L)	BICAR- BONATE (MG/L AS HCO3)	ALKA- LITY (MG/L AS CACO3)	CARBON DIOXIDE DIS- SOLVED (MG/L AS CO2)
DATE	TIME									
JUN 23...	1135	3.0	.00	525	8.4	22.5	9.8	240	200	1.5
		NITRO- GEN, NITRATE TOTAL (MG/L AS N)	NITRO- GEN, NITRITE TOTAL (MG/L AS N)	NITRO- GEN, NO2+NO3 TOTAL (MG/L AS N)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N)	NITRO- GEN, ORGANIC TOTAL (MG/L AS N)	NITRO- GEN,AM- MONIA + ORGANIC TOTAL (MG/L AS N)	NITRO- GEN, TOTAL (MG/L AS N)	NITRO- GEN, TOTAL (MG/L AS NO3)	PHOS- PHORUS, TOTAL (MG/L AS P)
DATE										
JUN 23...	1.2	.03	1.2	.07	.72	.79	2.0	8.8	.01	.00

414939084583300 COLDWATER LAKE, DEEP SITE, NEAR COLDWATER, MI (LAT 41 49 39 LONG 084 58 33)

DATE	TIME	DEPTH TO BOT- TOM OF SAMPLE INTER- VAL (FT)	RESER- VOIR DEPTH (FEET)	DEPTH TO TOP OF SAMPLE INTER- VAL (FT)	TRANS- PAR- ENCY (SECCHI DISK (IN)	COLI- FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML)	STREP- TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML)	HARD- NESS (MG/L AS CACO3)	CALCIUM DIS- SOLVED (MG/L AS CA)	MAGNE- SIUM, DIS- SOLVED (MG/L AS MG)	SODIUM, DIS- SOLVED (MG/L AS NA)	SODIUM PERCENT
JUN 23...	1055	22	88	22	174	K2	K4	190	48	18	5.0	5
JUN 23...	1100	66	88	66	--	--	--	210	54	18	4.8	5
DATE	TIME	SODIUM AD- SORP- TION RATIO	POTAS- SIUM, DIS- SOLVED (MG/L AS K)	ALKA- LITY (MG/L AS CACO3)	SULFATE SOLVED (MG/L AS SO4)	CHLO- RIDE, DIS- SOLVED (MG/L AS CL)	FLUO- RIDE, DIS- SOLVED (MG/L AS F)	SILICA, DIS- SOLVED (MG/L AS SiO2)	SOLIDS, RESIDUE AT 180 DEG. C DIS- SOLVED (MG/L)	SOLIDS, DIS- SOLVED (TONS PER AC-FT)	NITRO- GEN, NITRATE TOTAL (MG/L AS N)	NITRO- GEN, NITRITE TOTAL (MG/L AS N)
JUN 23...		.2	1.9	140	43	11	.1	2.6	283	.38	.42	.01
JUN 23...		.1	1.9	150	43	10	.1	6.8	300	.41	1.1	.01
DATE	TIME	NITRO- GEN, NO2+NO3 TOTAL (MG/L AS N)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N)	NITRO- GEN, ORGANIC TOTAL (MG/L AS N)	NITRO- GEN,AM- MONIA + ORGANIC TOTAL (MG/L AS N)	NITRO- GEN, TOTAL (MG/L AS N)	NITRO- GEN, TOTAL (MG/L AS NO3)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, ORTHO. TOTAL (MG/L AS P)	IRON, DIS- SOLVED (UG/L AS FE)	MANGA- NESE, DIS- SOLVED (UG/L AS MN)
JUN 23...		.43	.43	.04	.54	.58	1.0	4.5	.00	.00	70	10
JUN 23...		1.1	.69	.00	.66	.66	1.8	7.8	.01	.00	60	20



## ANALYSES OF SAMPLES COLLECTED AT MISCELLANEOUS SITES

WATER QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

STREAMS TRIBUTARY TO LAKE MICHIGAN--CONTINUED

414939084583300 COLDWATER LAKE, DEEP SITE, NEAR COLDWATER, MI (LAT 41 49 39 LONG 084 58 33)--CONTINUED

DATE	TIME	SAMP- LING DEPTH (FT)	SPE- CIFIC CON- DUCT- ANCE (MICRO- MHOS)	PH (UNITS)	TEMPER- ATURE (DEG C)	OXYGEN, DIS- SOLVED (MG/L)
JUN						
23...	1033	8.0	390	8.5	22.0	9.8
23...	1034	16	380	8.4	21.0	9.5
23...	1035	24	360	8.1	16.0	8.2
23...	1036	32	340	8.0	12.5	7.4
23...	1037	40	330	7.9	11.5	6.8
23...	1038	48	320	7.8	10.5	6.4
23...	1039	56	315	7.8	10.0	6.2
23...	1040	64	310	7.8	9.0	6.0
23...	1041	72	300	7.7	8.5	5.6
23...	1042	80	300	7.7	8.0	5.2
23...	1043	88	300	7.6	7.5	1.2

04096440 COLDWATER RIVER (COLDWATER LAKE OUTLET) NEAR KINDERHOOK, MI (LAT 41 50 23 LONG 084 00 03)

DATE	TIME	STREAM- FLOW, INSTAN- TANEOUS (CFS)	SPE- CIFIC CON- DUCT- ANCE (MICRO- MHOS)	PH (UNITS)	TEMPER- ATURE (DEG C)	OXYGEN, DIS- SOLVED (MG/L)	BICAR- BONATE (MG/L AS HC03)	ALKA- LINITY (MG/L AS CAC03)	CARBON DIOXIDE DIS- SOLVED (MG/L AS C02)	NITRO- GEN, NITRATE TOTAL (MG/L AS N)
JUN										
23...	1245	64.7	370	8.3	23.0	11.4	150	120	1.2	.22

DATE	NITRO- GEN, NITRITE TOTAL (MG/L AS N)	NITRO- GEN, NO2+NO3 TOTAL (MG/L AS N)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N)	NITRO- GEN, ORGANIC TOTAL (MG/L AS N)	NITRO- GEN,AM- MONIA + ORGANIC TOTAL (MG/L AS N)	NITRO- GEN, TOTAL (MG/L AS N)	NITRO- GEN, TOTAL (MG/L AS NO3)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, ORTHO. TOTAL (MG/L AS P)
JUN									
23...	.01	.23	.00	.60	.60	.83	3.7	.01	.00

B--ESTIMATED VALUE

## WATER QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

## STREAMS TRIBUTARY TO LAKE MICHIGAN--Continued

420440086112800 CROOKED LAKE, SITE 1, AT SISTER LAKES, MI (LAT 42 04 40 LONG 086 11 28)

DATE	TIME	SAMP- LING DEPTH (FT)	SPE- CIFIC CON- DUCT- ANCE (MICRO- MHOS)	PH (UNITS)	TEMPER- ATURE (DEG C)	OXYGEN, DIS- SOLVED (MG/L)
JUN						
21...	1620	2.0	230	8.6	24.0	9.4
21...	1622	4.0	228	8.6	24.0	9.4
21...	1623	6.0	228	8.6	24.0	9.4
21...	1625	8.0	228	8.6	23.5	9.3
21...	1626	10	225	8.7	23.0	9.6
21...	1628	12	225	8.7	22.0	9.7
21...	1629	14	220	8.7	21.5	9.8
21...	1630	16	218	8.6	19.5	9.6
21...	1631	18	215	8.4	17.5	9.9
21...	1633	20	210	8.4	15.0	9.6
21...	1634	22	207	8.2	13.5	8.7
21...	1635	24	200	8.0	12.0	8.0
21...	1636	26	200	7.9	11.0	7.1
21...	1637	28	198	7.8	10.5	6.1
21...	1638	30	198	7.6	10.0	5.1
21...	1639	32	195	7.6	9.0	3.6
21...	1640	34	192	7.5	8.0	1.6
21...	1641	36	192	7.4	8.0	.8
21...	1642	38	192	7.4	8.0	.4
21...	1644	40	192	7.4	7.5	.3
21...	1645	42	192	7.4	7.0	.2
21...	1646	44	192	7.4	7.0	.1
21...	1647	46	210	7.0	7.0	.1

DATE	TIME	DEPTH TO BOT- TOM OF SAMPLE INTER- VAL (FT)	RESER- VOIR DEPTH (FEET)	DEPTH TO TOP OF SAMPLE INTER- VAL (FT)	TRANS- PAR- ENCY (SECCHI DISK) (IN)	HARD- NESS (MG/L AS CAC03)	CALCIUM DIS- SOLVED (MG/L AS CA)	MAGNE- SIUM, DIS- SOLVED (MG/L AS MG)	SODIUM, DIS- SOLVED (MG/L AS NA)	SODIUM PERCENT
JUN										
21...	1655	12	46	12	168	120	28	12	6.2	10
21...	1745	34	46	34	--	130	33	12	6.0	9

DATE	SODIUM AD- SORP- TION RATIO	POTAS- SIUM, DIS- SOLVED (MG/L AS K)	ALKA- LINITY (MG/L AS CAC03)	SULFATE DIS- SOLVED (MG/L AS SO4)	CHLO- RIDE, DIS- SOLVED (MG/L AS CL)	FLUO- RIDE, DIS- SOLVED (MG/L AS F)	SILICA, DIS- SOLVED (MG/L AS SiO2)	SOLIDS, RESIDUE AT 180 DEG. C DIS- SOLVED (MG/L)	SOLIDS, DIS- SOLVED (TONS PER AC-FT)
JUN									
21...	.2	1.2	99	8.3	15	.1	.4	171	.23
21...	.2	1.4	110	7.6	15	.1	.3	170	.23

DATE	NITRO- GEN, NITRITE TOTAL (MG/L AS N)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N)	NITRO- GEN, ORGANIC TOTAL (MG/L AS N)	NITRO- GEN,AM- MONIA + ORGANIC TOTAL (MG/L AS N)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, ORTHO, TOTAL (MG/L AS P)	IRON, DIS- SOLVED (UG/L AS FE)	MANGA- NESE, DIS- SOLVED (UG/L AS MN)
JUN									
21...	.01	.00	.00	.50	.50	.01	.00	70	0
21...	.01	.03	.00	.47	.47	.01	.00	50	30

## ANALYSES OF SAMPLES COLLECTED AT MISCELLANEOUS SITES

WATER QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

STREAMS TRIBUTARY TO LAKE MICHIGAN--Continued

420410086121400 CROOKED LAKE, SITE 2, AT SISTER LAKES, MI (LAT 42 04 10 LONG 086 12 14)

DATE	TIME	DEPTH TO BOT- TOM OF SAMPLE INTER- VAL (FT)	RESER- VOIR DEPTH (FEET)	DEPTH TO TOP OF SAMPLE INTER- VAL (FT)	SPE- CIFIC CON- DUCT- ANCE (MICRO- MHOS)	PH (UNITS)	TEMPER- ATURE (DEG C)	OXYGEN, DIS- SOLVED (MG/L)	COLI- FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML)	STREP- TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML)	BICAR- BONATE (MG/L AS HC03)	ALKA- LINITY (MG/L AS CAC03)
JUN 21...	1400	3.0	6.5	3.0	225	8.3	24.0	8.8	K5	18	120	98

DATE	CARBON DIOXIDE DIS- SOLVED (MG/L AS CO2)	NITRO- GEN, NITRATE TOTAL (MG/L AS N)	NITRO- GEN, NITRITE TOTAL (MG/L AS N)	NITRO- GEN, NO2+NO3 TOTAL (MG/L AS N)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N)	NITRO- GEN, ORGANIC TOTAL (MG/L AS N)	NITRO- GEN,AM- MONIA + ORGANIC TOTAL (MG/L AS N)	NITRO- GEN, TOTAL (MG/L AS N)	NITRO- GEN, TOTAL (MG/L AS NO3)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, ORTHO. TOTAL (MG/L AS P)
JUN 21...	1.0	.00	.00	.00	.00	.43	.43	.43	1.9	.01	.00

420421086122100 CROOKED LAKE, SITE 3, AT SISTER LAKES, MI (LAT 42 04 21 LONG 086 12 21)

DATE	TIME	DEPTH TO BOT- TOM OF SAMPLE INTER- VAL (FT)	RESER- VOIR DEPTH (FEET)	DEPTH TO TOP OF SAMPLE INTER- VAL (FT)	SPE- CIFIC CON- DUCT- ANCE (MICRO- MHOS)	PH (UNITS)	TEMPER- ATURE (DEG C)	OXYGEN, DIS- SOLVED (MG/L)	COLI- FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML)	STREP- TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML)	BICAR- BONATE (MG/L AS HC03)	ALKA- LINITY (MG/L AS CAC03)
JUN 21...	1345	10	22	10	222	8.3	22.5	7.2	K3	17	120	98

DATE	CARBON DIOXIDE DIS- SOLVED (MG/L AS CO2)	NITRO- GEN, NITRATE TOTAL (MG/L AS N)	NITRO- GEN, NITRITE TOTAL (MG/L AS N)	NITRO- GEN, NO2+NO3 TOTAL (MG/L AS N)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N)	NITRO- GEN, ORGANIC TOTAL (MG/L AS N)	NITRO- GEN,AM- MONIA + ORGANIC TOTAL (MG/L AS N)	NITRO- GEN, TOTAL (MG/L AS N)	NITRO- GEN, TOTAL (MG/L AS NO3)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, ORTHO. TOTAL (MG/L AS P)
JUN 21...	1.0	.00	.00	.00	.00	.45	.45	.45	2.0	.01	.00

K--BASED ON COLONY COUNT OUTSIDE THE ACCEPTABLE RANGE (NON-IDEAL COLONY COUNT)

## WATER QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

## STREAMS TRIBUTARY TO LAKE MICHIGAN--Continued

420445086122600 ROUND LAKE, SITE 1, AT SISTER LAKES, MI (LAT 42 04 45 LONG 086 12 26)

DATE	TIME	SAMP- LING DEPTH (FT)	SPF- CIFIC CON- DUCT- ANCE (MICRO- MHOS)	PH (UNITS)	TEMPER- ATURE (DEG C)	OXYGEN, DIS- SOLVED (MG/L)
JUN						
20...	1440	2.0	85	8.3	24.0	8.7
20...	1444	4.0	93	8.4	23.5	8.5
20...	1447	6.0	90	8.4	22.5	8.5
20...	1448	8.0	90	7.9	22.0	8.0
20...	1450	10	90	7.9	21.5	7.8
20...	1452	12	90	7.5	21.0	6.6
20...	1453	14	90	7.5	21.0	5.8
20...	1455	16	90	7.4	20.0	4.4
20...	1456	18	90	7.0	18.5	.8
20...	1502	20	92	6.8	16.0	.9
20...	1518	22	90	6.6	15.0	.3
20...	1520	24	90	6.8	14.0	.2
20...	1522	26	93	6.8	13.5	.0
20...	1525	28	100	6.9	13.5	.0

DATE	TIME	DEPTH TO BOT- TOM OF SAMPLE INTER- VAL (FT)	RESER- VOIR DEPTH (FEET)	DEPTH TO TOP OF SAMPLE INTER- VAL (FT)	HARD- NESS (MG/L AS CACO3)	CALCIUM DIS- SOLVED (MG/L AS CA)	MAGNE- SIUM, DIS- SOLVED (MG/L AS MG)	SODIUM, DIS- SOLVED (MG/L AS NA)	SODIUM PERCENT	SODIUM AD- SORP- TION RATIO	POTAS- SIUM, DIS- SOLVED (MG/L AS K)
JUN											
20...	1530	8.0	27	8.0	36	9.4	3.0	2.3	12	.2	1.1
20...	1610	22	27	22	38	10	3.2	2.2	11	.2	1.2

DATE	ALKA- LINITY (MG/L AS CACO3)	SULFATE DIS- SOLVED (MG/L AS SO4)	CHLO- RIDE, DIS- SOLVED (MG/L AS CL)	FLUO- RIDE, DIS- SOLVED (MG/L AS F)	SILICA, DIS- SOLVED (MG/L AS SiO2)	SOLIDS, RESIDUE AT 180 DEG. C DIS- SOLVED (MG/L)	SOLIDS, DIS- SOLVED (TONS PER AC-FT)	NITRO- GEN, NITRATE TOTAL (MG/L AS N)	NITRO- GEN, NITRITE TOTAL (MG/L AS N)	NITRO- GEN, NO2+NO3 TOTAL (MG/L AS N)
JUN										
20...	36	4.1	3.9	.1	.1	62	.08	.00	.00	.00
20...	34	3.9	4.2	.1	.2	61	.08	.00	.00	.00

DATE	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N)	NITRO- GEN, ORGANIC TOTAL (MG/L AS N)	NITRO- GEN,AM- MONIA + ORGANIC TOTAL (MG/L AS N)	NITRO- GEN, TOTAL (MG/L AS N)	NITRO- GEN, TOTAL (MG/L AS NO3)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, ORTHO. TOTAL (MG/L AS P)	IRON, DIS- SOLVED (UG/L AS FE)	MANGA- NESE, DIS- SOLVED (UG/L AS MN)
JUN										
20...	.00	.03	.57	.60	.60	2.7	.02	.00	10	10
20...	.00	.00	.61	.61	.61	2.7	.02	.00	60	10

## ANALYSES OF SAMPLES COLLECTED AT MISCELLANEOUS SITES

WATER QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

STREAMS TRIBUTARY TO LAKE MICHIGAN--Continued

420447086125500 ROUND LAKE, SITE 2, AT SISTER LAKES, MI (LAT 42 04 47 LONG 086 12 55)

DATE	TIME	DEPTH TO BOT- TOM OF SAMPLE INTER- VAL (FT)	RESER- VOIR DEPTH (FEET)	DEPTH TO TOP OF SAMPLE INTER- VAL (FT)	SPE- CIFIC CON- DUCT- ANCE (MICRO- MHOS)	PH (UNITS)	TEMPER- ATURE (DEG C)	TRANS- PAR- ENCY (SECCHI DISK) (IN)	OXYGEN, DIS- SOLVED (MG/L)	COLI- FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML)	STREP- TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML)	BICAR- BONATE (MG/L AS HCO3)	
JUN 20...	1145	4.0	8.0	4.0	90	8.0	23.5	66	8.2	K7	K2	46	
DATE	TIME	ALKA- LINITY (MG/L AS CAC03)	CARBON DIOXIDE DIS- SOLVED (MG/L AS CO2)	NITRO- GEN, NITRATE TOTAL (MG/L AS N)	NITRO- GEN, NITRITE TOTAL (MG/L AS N)	NITRO- GEN, NO2+NO3 TOTAL (MG/L AS N)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N)	NITRO- GEN, ORGANIC TOTAL (MG/L AS N)	NITRO- GEN,AM- MONIA + ORGANIC TOTAL (MG/L AS N)	NITRO- GEN, TOTAL (MG/L AS N)	NITRO- GEN, TOTAL (MG/L AS NO3)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, ORTHO. TOTAL (MG/L AS P)
JUN 20...	38		.7	.00	.00	.00	.01	.59	.60	.60	2.7	.02	.00

420453086122500 ROUND LAKE, SITE 3, AT SISTER LAKES, MI (LAT 42 04 53 LONG 086 12 25)

DATE	TIME	DEPTH TO BOT- TOM OF SAMPLE INTER- VAL (FT)	RESER- VOIR DEPTH (FEET)	DEPTH TO TOP OF SAMPLE INTER- VAL (FT)	SPE- CIFIC CON- DUCT- ANCE (MICRO- MHOS)	PH  (UNITS)	TEMPER- ATURE (DEG C)	TRANS- PAR- ENCY (SECCHI DISK) (IN)	OXYGEN, DIS- SOLVED (MG/L)	COLI- FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML)	STREP- TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML)	BICAR- BONATE (MG/L AS HC03)	
JUN 20...	1115	5.0	9.0	5.0	90	8.2	23.5	66	8.4	K2	K1	37	
DATE	TIME	ALKA- LINITY (MG/L AS CAC03)	CARBON DIOXIDE DIS- SOLVED (MG/L AS C02)	NITRO- GEN, NITRATE TOTAL (MG/L AS N)	NITRO- GEN, NITRITE TOTAL (MG/L AS N)	NITRO- GEN, NO2+NO3 TOTAL (MG/L AS N)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N)	NITRO- GEN, ORGANIC TOTAL (MG/L AS N)	NITRO- GEN,AM- MONIA + ORGANIC TOTAL (MG/L AS N)	NITRO- GEN, TOTAL (MG/L AS N)	NITRO- GEN, TOTAL (MG/L AS N03)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, ORTHO. TOTAL (MG/L AS P)
JUN 20...	30		.4	.00	.00	.00	.02	.55	.57	.57	2.5	.02	.00

K--BASED ON COLONY COUNT OUTSIDE THE ACCEPTABLE RANGE (NON-IDEAL COLONY COUNT)



## WATER QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

## STREAMS TRIBUTARY TO LAKE MICHIGAN--CONTINUED

421009085581000 EAGLE LAKE, SITE 1, NEAR DECATUR, MI (LAT 42 10 09 LONG 085 58 10)

		SAMP- LING DEPTH (FT)	SPE- CIFIC CON- DUCT- ANCE (MICRO- MHOS)	PH (UNITS)	TEMPER- ATURE (DEG C)	OXYGEN, DIS- SOLVED (MG/L)
DATE	TIME					
JUN						
22...	1251	2.0	215	8.7	22.5	9.2
22...	1252	4.0	215	8.7	22.5	9.3
22...	1253	6.0	212	8.7	22.5	9.4
22...	1254	8.0	210	8.7	22.5	9.4
22...	1255	10	210	8.7	22.5	9.4
22...	1256	12	210	8.7	22.0	8.8
22...	1257	14	210	8.7	22.0	9.7
22...	1301	16	210	8.7	21.0	10.1
22...	1302	18	208	8.6	19.5	10.7
22...	1303	20	200	8.6	17.0	11.8
22...	1305	22	195	8.5	15.0	11.2
22...	1306	24	195	8.3	14.0	10.4
22...	1307	26	195	8.0	13.0	8.7
22...	1308	28	190	7.8	12.5	7.2
22...	1311	30	190	7.7	12.0	6.8
22...	1312	32	190	7.6	11.5	6.5
22...	1314	34	190	7.2	11.5	6.6
22...	1317	36	190	7.2	11.0	6.6
22...	1318	38	190	7.2	10.5	5.8
22...	1319	40	190	7.1	10.0	5.2
22...	1320	42	188	7.1	10.0	4.4
22...	1321	44	188	7.0	9.5	3.6
22...	1322	46	188	7.0	9.5	3.0
22...	1323	48	188	7.0	9.5	.6

DATE	TIME	DEPTH TO BOT- TOM OF SAMPLE INTER- VAL (FT)	RESER- VOIR DEPTH (FEET)	DEPTH TO TOP OF SAMPLE INTER- VAL (FT)	HARD- NESS (MG/L AS CACO3)	CALCIUM DIS- SOLVED (MG/L AS CA)	MAGNE- SIUM, DIS- SOLVED (MG/L AS MG)	SODIUM, DIS- SOLVED (MG/L AS NA)
JUN								
22...	1330	12	48	12	110	27	11	2.0
22...	1410	36	48	36	120	28	11	1.9

DATE	SODIUM PERCENT	SODIUM AD- SORP- TION RATIO	POTAS- SIUM, DIS- SOLVED (MG/L AS K)	ALKA- LINITY (MG/L AS CACO3)	SULFATE DIS- SOLVED (MG/L AS SO4)	CHLO- RIDE, DIS- SOLVED (MG/L AS CL)	FLUO- RIDE, DIS- SOLVED (MG/L AS F)	SILICA, DIS- SOLVED (MG/L AS SiO2)	SOLIDS, RESIDUE AT 180 DEG. C DIS- SOLVED (MG/L)
JUN									
22...	4	.1	1.2	94	9.6	7.8	.1	.4	134
22...	3	.1	1.2	98	8.7	5.7	.1	.5	135

DATE	SOLIDS, DIS- SOLVED (TONS PER AC-FT)	NITRO- GEN, NITRITE TOTAL (MG/L AS N)	NITRO- GEN, TOTAL (MG/L AS N)	NITRO- GEN, TOTAL (MG/L AS NO3)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, ORTHO. TOTAL (MG/L AS P)	IRON, DIS- SOLVED (UG/L AS FE)	MANGA- NESE, DIS- SOLVED (UG/L AS MN)
JUN								
22...	.18	.00	.37	1.6	.01	.00	320	0
22...	.18	.00	.42	1.9	.02	.00	130	10

## ANALYSES OF SAMPLES COLLECTED AT MISCELLANEOUS SITES

WATER QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

STREAMS TRIBUTARY TO LAKE MICHIGAN--Continued

421020085583500 EAGLE LAKE, SITE 2, NEAR DECATUR, MI (LAT 42 10 20 LONG 085 58 35)

DATE	TIME	DEPTH TO BOT- TOM OF SAMPLE INTER- VAL (FT)	RESER- VOIR DEPTH (FEET)	DEPTH TO TOP OF SAMPLE INTER- VAL (FT)	SPE- CIFIC CON- DUCT- ANCE (MICRO- MHOS)	PH (UNITS)	TEMPER- ATURE (DEG C)	TRANS- PAR- ENCY (SECCHI DISK) (IN)	OXYGEN, DIS- SOLVED (MG/L)	COLI- FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML)
JUN 22...	1030	10	20	10	210	8.6	22.0	216	9.1	<1

DATE	STREP- TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML)	BICAR- BONATE (MG/L AS HCO3)	ALKA- LINITY (MG/L AS CACO3)	CARBON DIOXIDE DIS- SOLVED (MG/L AS CO2)	NITRO- GEN, NITRITE TOTAL (MG/L AS N)	NITRO- GEN, TOTAL (MG/L AS N)	NITRO- GEN, TOTAL (MG/L AS NO3)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, ORTHO. TOTAL (MG/L AS P)
JUN 22...	58	120	98	.5	.00	.42	1.9	.01	.00

421005085584000 EAGLE LAKE, SITE 3, NEAR DECATUR, MI (LAT 42 10 05 LONG 085 58 40)

DATE	TIME	DEPTH TO BOT- TOM OF SAMPLE INTER- VAL (FT)	RESER- VOIR DEPTH (FEET)	DEPTH TO TOP OF SAMPLE INTER- VAL (FT)	SPE- CIFIC CON- DUCT- ANCE (MICRO- MHOS)	PH (UNITS)	TEMPER- ATURE (DEG C)	TRANS- PAR- ENCY (SECCHI DISK) (IN)	OXYGEN, DIS- SOLVED (MG/L)	COLI- FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML)
JUN 22...	1000	9.0	18	9.0	214	8.6	22.0	186	9.2	K1

DATE	STREP- TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML)	BICAR- BONATE (MG/L AS HCO3)	ALKA- LINITY (MG/L AS CACO3)	CARBON DIOXIDE DIS- SOLVED (MG/L AS CO2)	NITRO- GEN, NITRITE TOTAL (MG/L AS N)	NITRO- GEN, TOTAL (MG/L AS N)	NITRO- GEN, TOTAL (MG/L AS NO3)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, ORTHO. TOTAL (MG/L AS P)
JUN 22...	14	120	98	.5	.00	.42	1.9	.01	.00

K--BASED ON COLONY COUNT OUTSIDE THE ACCEPTABLE RANGE (NON-IDEAL COLONY COUNT)

## WATER QUALITY DATA, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

## STREAMS TRIBUTARY TO LAKE MICHIGAN--Continued

421214086590600 CORA LAKE, SITE 1, NEAR LAWRENCE, MI (LAT 42 12 14 LONG 086 59 06)

DATE	TIME	SAMP- LING DEPTH (FT)	SPE- CIFIC CON- DUCT- ANCE (MICRO- MHOS)	PH (UNITS)	TEMPER- ATURE (DEG C)	OXYGEN, DIS- SOLVED (MG/L)
JUN						
22...	1753	5.0	222	8.8	23.0	9.6
22...	1754	10	222	8.8	22.5	9.8
22...	1755	15	220	8.8	22.0	10.0
22...	1756	20	215	8.6	19.0	10.8
22...	1757	25	208	8.3	15.0	10.0
22...	1758	30	200	8.1	12.0	8.8
22...	1759	35	195	7.9	10.0	7.8
22...	1800	40	190	7.8	9.0	6.6
22...	1801	45	190	7.7	8.0	5.8
22...	1802	50	190	7.6	8.0	4.9
22...	1804	55	190	7.6	8.0	4.4
22...	1805	58	190	7.6	8.0	3.3

421210086591900 CORA LAKE, SITE 2, NEAR LAWRENCE, MI (LAT 42 12 10 LONG 086 59 19)

DATE	TIME	DEPTH TO BOT- TOM OF SAMPLE INTER- VAL (FT)	RESER- VOIR DEPTH (FEET)	DEPTH TO TOP OF SAMPLE INTER- VAL (FT)	SPE- CIFIC CON- DUCT- ANCE (MICRO- MHOS)	PH (UNITS)	TEMPER- ATURE (DEG C)	TRANS- PAR- ENCY (SECCHI DISK) (IN)	OXYGEN, DIS- SOLVED (MG/L)	COLI- FORM, FECAL, UM-MF (COLS./ 100 ML)	STREP- TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML)	BICAR- BONATE (MG/L AS HC03)
JUN												
22...	1840	10	19	10	220	8.8	22.5	180	9.9	K1	53	120

DATE	TIME	ALKA- LITY (MG/L AS CAC03)	CARBON DIOXIDE DIS- SOLVED (MG/L AS CO2)	NITRO- GEN, NITRATE TOTAL (MG/L AS N)	NITRO- GEN, NITRITE TOTAL (MG/L AS N)	NITRO- GEN, NO2+NO3 TOTAL (MG/L AS N)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N)	NITRO- GEN, ORGANIC TOTAL (MG/L AS N)	NITRO- GEN,AM- MONIA + ORGANIC TOTAL (MG/L AS N)	NITRO- GEN, TOTAL (MG/L AS N)	NITRO- GEN, TOTAL (MG/L AS NO3)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, ORTHO, TOTAL (MG/L AS P)
JUN													
22...	98		.3	.01	.00	.01	.00	.49	.49	.50	2.2	.01	.00

421156086584800 CORA LAKE, SITE 3, NEAR LAWRENCE, MI (LAT 42 11 56 LONG 086 58 48)

DATE	TIME	DEPTH TO BOT- TOM OF SAMPLE INTER- VAL (FT)	RESER- VOIR DEPTH (FEET)	DEPTH TO TOP OF SAMPLE INTER- VAL (FT)	SPE- CIFIC CON- DUCT- ANCE (MICRO- MHOS)	PH (UNITS)	TEMPER- ATURE (DEG C)	OXYGEN, DIS- SOLVED (MG/L)	COLI- FORM, FECAL, UM-MF (COLS./ 100 ML)	STREP- TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML)	BICAR- BONATE (MG/L AS HC03)	ALKA- LITY (MG/L AS CAC03)
JUN												
22...	1820	2.0	4.0	2.0	218	9.9	24.5	12.0	K4	K270	110	90

DATE	TIME	CARBON DIOXIDE DIS- SOLVED (MG/L AS CO2)	NITRO- GEN, NITRATE TOTAL (MG/L AS N)	NITRO- GEN, NITRITE TOTAL (MG/L AS N)	NITRO- GEN, NO2+NO3 TOTAL (MG/L AS N)	NITRO- GEN, AMMONIA TOTAL (MG/L AS N)	NITRO- GEN, ORGANIC TOTAL (MG/L AS N)	NITRO- GEN,AM- MONIA + ORGANIC TOTAL (MG/L AS N)	NITRO- GEN, TOTAL (MG/L AS N)	NITRO- GEN, TOTAL (MG/L AS NO3)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, ORTHO, TOTAL (MG/L AS P)
JUN												
22...		.0	.12	.00	.12	.08	.43	.51	.63	2.8	.01	.01

K--BASED ON COLONY COUNT OUTSIDE THE ACCEPTABLE RANGE (NON-IDEAL COLONY COUNT)



FIGURE 9.--Map showing location of observation wells published in this report.

## ALGER COUNTY

461608086373801. Local number, 45N 19W 25BDDB.

LOCATION.--Lat 46°16'08", long 086°37'38", Hydrologic Unit 04060106, 250 ft (76 m) northwest of highway M-44, 0.2 mi (0.3 km) northeast of Kentucky.

Owner: U.S. Forest Service.

AQUIFER.--Glacial deposits of Pleistocene Age.

WELL CHARACTERISTICS.--Drilled artesian well, diameter 6 in (15 cm), depth 66 ft (20 m).

DATUM.--Altitude of land-surface datum is 850 ft (259 m). Measuring point: Top of casing, 3.60 ft (1.10 m) above land-surface datum.

PERIOD OF RECORD.--June 1959 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level measured, 6.35 ft (1.94 m) below land-surface datum, June 29, 1960; lowest measured, 14.19 ft (4.33 m) Apr. 3, 1964.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
NOV 10	11.08	FEB 10	11.24	JUN 13	9.90	SEP 28	9.50

## ALPENA COUNTY

450850083393401. Local number, 32N 6E 23DDDA.

LOCATION.--Lat 45°08'50", long 083°39'34", Hydrologic Unit 04070006, on Graham Road, 3 mi (5 km) east and 1.5 mi (2.4 km) north of Long Rapids.

Owner: U.S. Geological Survey.

AQUIFER.--Sand of Pleistocene Age.

WELL CHARACTERISTICS.--Drilled water table observation well, diameter 6 in (15 cm), depth 88 ft (27 m), screened 79 to 88 ft (24 to 27 m).

DATUM.--Altitude of land-surface datum is 713 ft (217 m). Measuring point: Plywood instrument shelf, 217 ft (0.8 m) above land-surface

REMARKS.--Bottom of hole near top of bedrock.

PERIOD OF RECORD.--November 1976 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 17.13 ft (5.22 m) below land-surface datum, May 8, 1978; lowest, 28.73 ft (8.76 m) Mar. 10, 1977.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
LOW VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	25.55	27.08	27.09	24.95	24.81	25.41	25.11	17.47	18.16	19.50	21.31	23.43
10	25.56	27.03	26.18	24.75	24.81	25.46	23.98	18.20	18.46	19.83	21.73	23.70
15	25.40	27.07	26.04	24.52	24.99	25.64	21.72	18.38	18.67	20.09	22.12	23.54
20	25.65	27.30	25.90	24.56	25.11	25.74	19.52	18.36	18.72	20.55	22.64	23.39
25	25.78	27.21	25.43	24.53	25.24	25.79	18.64	18.70	18.86	20.46	22.89	23.20
EOM	26.14	27.33	25.20	24.77	25.32	25.56	18.00	18.51	19.26	20.86	23.17	23.10

WTR YEAR 1978 MAX 17.13 MAY 8, 1978 MIN 27.36 NOV 28, 1977

## BARAGA COUNTY

463353088144301. Local number, 48N 32W 12DDCC.

LOCATION.--Lat 46°33'53", long 088°14'43", Hydrologic Unit 04030107, 95 ft (29 m) north of U.S. Highway 41 and 0.5 mi (0.8 km) south-east of Nestoria Road.

Owner: Michigan State Highway Department.

AQUIFER.--Sand and gravel of Pleistocene Age.

WELL CHARACTERISTICS.--Drilled water-table well, diameter 1½ in (3.2 cm), depth 10 ft (3 m), screened 7 to 10 ft (2 to 3 m).

DATUM.--Altitude of land-surface datum is 1,630 ft (497 m). Measuring point: Top of casing, 4.78 ft (1.46 m) above land-surface datum.

REMARKS.--Measurements made by Wisconsin-Michigan Power Company.

PERIOD OF RECORD.--September 1948 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level measured, 3.27 ft (1.00 m) below land-surface datum, Apr. 30, 1965; lowest measured, 8.09 ft (2.47 m) Sept. 2, 1960.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 31	6.46	JAN 2	6.57	MAR 1	6.78	APR 30	4.53	JUN 29	6.42	SEP 28	6.08
DEC 1	6.41	FEB 1	6.67	30	6.70	MAY 31	6.17	AUG 31	5.34		



## GROUND-WATER LEVELS

## BARRY COUNTY

4245400852320. Local number, 4N 9W 5DAAA.

LOCATION.--Lat 42°45'40", long 085°23'20", Hydrologic Unit 04050007, on Solomon Road 4 mi (6 km) east and 3.5 mi (5.6 km) north of Middleville.

Owner: State Department of Natural Resources.

AQUIFER.--Glacial deposits of Pleistocene Age.

WELL CHARACTERISTICS.--Drilled water table well, diameter 2 in (5 cm), depth 131 ft (40 m).

DATUM.--Altitude of land-surface datum is 860 ft (262 m). Measuring point: Top of casing, 2 ft (1 m) above land-surface datum.

PERIOD OF RECORD.--December 1964 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level measured, 111.5 ft (34.0 m) below land-surface datum, Mar. 20, 1978; lowest measured, 122.0 ft (37.2 m) Mar. 5, 1965.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
DEC 16	114.4	MAR 20	111.5	SEP 11	116.8

## BAY COUNTY

435128083582401. Local number, 17N 4E 22DCAA.

LOCATION.--Lat 43°51'28", long 083°58'24", Hydrologic Unit 04080102, at end of Second Street, Pinconning.

Owner: Pinconning Township.

AQUIFER.--Saginaw Formation of Pennsylvania Age.

WELL CHARACTERISTICS.--Drilled artesian well, diameter 6 in (15 cm), depth 110 ft (33 m), cased to 60 ft (18 m), open end.

DATUM.--Altitude of land-surface datum is 620 ft (189 m). Measuring point: Plywood shelter base, 2.00 ft (0.61 m) above land-surface datum.

REMARKS.--Water levels affected by regional pumping.

PERIOD OF RECORD.--August 1962 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level 0.05 ft (0.02 m) below land-surface datum, Mar. 5, 1976; lowest, 10.53 ft (3.21 m) Aug. 8, 1963.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
LOW VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	2.36	2.00	1.52	1.53	1.46	--	1.54	--	--	2.97	--	--
10	2.20	1.71	1.63	1.55	1.41	--	1.63	--	2.95	--	--	--
15	2.12	1.64	1.49	--	1.35	--	1.75	1.79	2.67	--	--	--
20	2.06	1.78	1.38	--	1.30	--	1.76	2.03	2.34	--	--	--
25	2.03	1.65	1.47	1.38	--	--	2.22	2.45	2.46	--	3.32	--
EOB	1.96	1.66	1.71	1.40	--	--	1.78	2.40	2.92	--	--	2.91

WTR YEAR 1978 MAX 0.80 JAN 26, 1978 MIN 4.72 AUG 1978

## BRANCH COUNTY

415602084593701. Local number, 6S 6W 22CABA.

LOCATION.--Lat 41°56'02", long 084°59'37", Hydrologic Unit 04050001, at Bennett and Tibbits Streets, Coldwater.

Owner: City of Coldwater.

AQUIFER.--Sand and gravel of Pleistocene Age.

WELL CHARACTERISTICS.--Drilled artesian well, diameter 6 in (15 cm), depth 113 ft (34 m), screened 73 to 113 ft (22 to 34 m).

DATUM.--Altitude of land-surface datum is 970 ft (296 m). Measuring point: Plywood shelter base, 2.50 ft (0.76 m) above land-surface datum.

REMARKS.--Water levels affected by nearby pumping.

PERIOD OF RECORD.--January 1964 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 9.0 ft (2.7 m) below land-surface datum, May 6, 1975; lowest, 25.9 ft (7.9 m) May 25, 1977.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
LOW VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	22.7	--	23.2	21.9	21.8	23.0	20.9	20.9	21.9	--	--	--
10	--	23.6	17.4	--	22.0	23.2	20.5	20.9	--	21.3	--	--
15	23.8	23.8	23.1	21.9	--	22.5	19.2	20.9	22.1	--	21.9	--
20	16.8	21.5	22.6	22.5	--	--	20.8	--	--	23.7	23.4	21.5
25	23.3	19.4	17.5	17.8	22.8	16.6	20.3	21.4	16.1	22.4	23.8	--
EOB	23.2	23.6	20.2	21.9	23.3	21.2	20.6	21.9	21.0	23.4	--	--

WTR YEAR 1978 MAX 10.2 APR 9, 1978 MIN 24.5 SEP 1978

## GROUND-WATER LEVELS

429

## CALHOUN COUNTY

422422085071501. Local number, 1S 7W 10BBAB.

LOCATION.--Lat 42°24'22", long 085°07'15", Hydrologic Unit 04050003, at highways M-78 and M-66, 5 mi (8 km) north of Battle Creek.

Owner: Rilla Sabin.

AQUIFER.--Glacial deposits of Pleistocene Age.

WELL CHARACTERISTICS.--Dug water-table well, diameter 15 in (38 cm), depth 12 ft (4 m), open tile bottom.

DATUM.--Land-surface datum is 907.99 ft (276.76 m) National Geodetic Vertical Datum of 1929. Measuring point: Top of casing, 1.50 ft (0.46 m) above land-surface datum.

REMARKS.--Measured by observer.

PERIOD OF RECORD.--September 1946 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level measured, 0.89 ft (0.27 m) below land-surface datum, Mar. 28, 1950; lowest, dry, July 29, 1964.

## WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 5	4.34	DEC 7	4.83	FEB 8	4.40	APR 12	3.53	JUN 14	3.50	AUG 9	3.20
12	4.46	14	4.90	15	4.48	19	3.06	21	3.47	16	3.30
19	4.54	21	4.64	22	4.48	26	3.02	28	2.10	23	3.45
22	4.52	28	4.55	MAR 1	4.40	MAY 3	3.16	JUL 5	2.12	30	3.55
NOV 2	4.53	JAN 4	4.70	8	4.09	10	3.10	12	2.30	SEP 6	3.80
9	4.80	11	4.50	15	3.97	17	3.20	19	2.85	13	3.86
16	4.93	18	4.30	22	3.90	24	3.32	26	3.02	20	3.74
23	4.91	25	4.27	29	3.87	31	3.45	AUG 2	3.00	27	3.69
30	4.95	FEB 1	4.30	APR 5	3.70	JUN 7	3.45				

## CALHOUN COUNTY

422025085084001. Local number, 1S 7W 32DABA.

LOCATION.--Lat 42°20'25", long 085°08'40", Hydrologic Unit 04050003, at Verona well field, Battle Creek.

Owner: City of Battle Creek.

AQUIFER: Marshall Formation of Mississippian Age.

WELL CHARACTERISTICS.--Drilled artesian well, diameter 8 in (20 cm), depth 127 ft (39 m), cased to 103 ft (31 m).

DATUM.--Land-surface datum is 830.79 ft (253.22 m) National Geodetic Vertical Datum of 1929. Measuring point: Recorder base, 2.10 ft (0.64 m) above land-surface datum.

REMARKS.--Water levels affected by nearby municipal pumping. Measurements made daily by Water Department.

PERIOD OF RECORD.--October 1939 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 0.7 ft (0.2 m) below land-surface datum, Apr. 26-27, 1950; lowest, 16.75 ft (5.11 m) July 16, 1959.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
LOW VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	6.00	7.00	5.90	5.60	5.80	8.30	6.75	6.50	6.50	5.80	6.40	7.90
10	6.70	6.60	6.50	6.80	6.30	7.50	6.30	6.20	6.80	5.60	7.00	8.10
15	8.15	6.20	6.30	6.20	6.60	7.50	6.20	5.80	7.70	6.40	7.80	7.75
20	6.20	6.60	5.90	6.10	6.60	7.60	5.70	7.10	7.70	7.40	6.80	7.40
25	6.10	6.20	5.80	5.70	7.00	6.70	6.30	6.20	7.10	6.90	8.60	6.60
EOM	6.20	6.00	5.90	6.10	7.90	5.90	6.70	6.60	6.30	7.70	8.00	6.60

## CASS COUNTY

414651085575601. Local number, 8S 14W 17BAAA.

LOCATION.--Lat 41°46'51", long 085°57'56", Hydrologic Unit 04050001, 2 mi (3 km) east of Adamsville on U.S. Highway 112.

Owner: Ted Little.

AQUIFER.--Glacial deposits of Pleistocene Age.

WELL CHARACTERISTICS.--Dug water-table well, diameter 28 in (71 cm), depth 55 ft (17 m), cribbed with brick to open bottom.

DATUM.--Altitude of land-surface datum is 840 ft (256 m). Measuring point: Top of wooden platform, 1.00 ft (0.30 m) above land-surface datum.

REMARKS.--Measured by observer.

PERIOD OF RECORD.--September 1945 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level measured, 46.20 ft (14.08 m) below land-surface datum, July 16, 1950; lowest, dry, Mar. 10, 1947.

## WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 24	51.85	DEC 22	51.35	FEB 27	51.10	APR 24	51.40	JUN 26	52.00	AUG 23	50.62
NOV 23	51.40	JAN 24	51.35	MAR 22	51.80	MAY 24	51.20	JUL 25	50.50	SEP 25	51.00

## CHEBOYGAN COUNTY

451304084232901. Local number. 33N 1W 26DABB.

LOCATION: --Lat 45°13'04", long 084°23'29", Hydrologic Unit 04070004, 10 mi (16 km) east of Wolverine on west side of Osmun Road, .25 mi (.40 km) west of Cornwall Lake.

Owner: State Department of Natural Resources.

AQUIFER.--Sand of Pleistocene Age.

WELL CHARACTERISTICS.--Drilled artesian well, diameter 6 in (15 cm), depth 164 ft (50 m), screened 157 to 164 ft (48 to 50 m).

DATUM.--Altitude of land-surface datum is 933 ft (284 m). Measuring point: Plywood instrument shelf, 3.43 ft (1.05 m) above land-surface datum.

PERIOD OF RECORD.--November 1965 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 56.2 ft (17.1 m) below land-surface datum, May 25, 1971; lowest, 59.9 ft (18.3 m), Dec. 6, 1965.

## WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

### LOW VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	--	58.98	58.97	--	--	58.76	--	57.70	57.33	57.50	57.71	--
10	--	--	--	--	--	58.80	--	57.68	57.30	--	57.73	--
15	--	--	--	--	--	58.83	--	57.51	57.35	--	57.77	--
20	--	--	58.95	58.82	--	58.82	--	57.38	57.34	57.61	57.90	--
25	--	--	--	--	58.72	--	--	57.35	57.36	57.65	57.90	--
EOM	--	--	--	--	58.78	--	57.94	57.29	57.36	57.70	57.94	--

## CHIPPewa COUNTY

462159084442201. Local number, 46N 4W 24DADA.

LOCATION.--Lat 46°21'59", long 084°44'22", Hydrologic Unit 04020203, on trail 0.2 mi (0.3 km) south of highway M-28 and 1 mi (2 km) west of Raco.

Owner: U.S. Forest Service.

AQUIFER.--Glacial deposits of Pleistocene Age.

WELL CHARACTERISTICS.--Drilled artesian well, diameter 6 in (15 cm), depth 54 ft (16 m).

DATUM.--Altitude of land-surface datum is 850 ft (259 m). Measuring point: Top of shelter base, 3.07 ft (0.94 m) above land-surface datum.

PERIOD OF RECORD.--June 1952 to April 1965. November 1969 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 18.40 ft (5.61 m) below land-surface datum, June 7, 1971; lowest, 28.43 ft (8.67 m) Apr. 14, 1964.

## WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

### LOW VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	23.82	23.91	23.58	--	--	24.47	24.78	24.08	22.60	22.56	--	23.45
10	23.84	23.85	23.59	23.86	--	24.55	24.85	23.73	22.58	22.68	--	23.49
15	23.84	23.90	23.57	23.89	24.22	24.60	24.87	23.49	22.56	--	--	23.50
20	23.82	23.77	--	--	24.29	24.64	25.09	23.22	22.53	--	--	23.43
25	23.79	23.73	--	--	24.34	24.70	25.09	22.96	22.51	22.87	23.35	23.28
EOM	23.83	23.68	--	--	24.36	24.72	24.62	22.73	22.52	--	--	23.17

WTR YEAR 1978    MAX    22.48 JUN 27, 1978            MIN EST.    25.1 APR 21, 1978

## CLINTON COUNTY

425410084323501. Local number. 6N 2W 16DDAD.

LOCATION.--Lat 42°54'10", long 084°32'35", Hydrologic Unit 04050005, at U.S. Highway 27, 6 mi (10 km) south of St. Johns.

Owner: State Highway Department.

AQUIFER.--Gravel of Pleistocene Age.

WELL CHARACTERISTICS.--Driven observation water-table well, diameter 2 in (51 cm), depth 26 ft (8 m), screened 23 to 26 ft (7 to 8 m).

DATUM.--Land-surface datum is 803.32 ft (244.85 m) National Geodetic Vertical Datum of 1929. Measuring point: Top of casing, 1.30 ft (0.40 m) above land-surface datum.

REMARKS.--Federal key well.

PERIOD OF RECORD.--August 1948 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level measured, 13.84 ft (4.22 m) below land-surface datum, Apr. 30, 1974; lowest measured, 19.93 ft (6.07 m) Feb. 27, 1964.

## WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

[illegible]

## 431

443308084245001. Local number, 25N 1W 15DDCD.

LOCATION.--Lat 44°33'08", long 084°24'50", Hydrologic Unit 04070007, 2.6 mi (4.2 km) south of Eldorado on highway M-18.

Owner: U.S. Forest Service.

AQUIFER.--Glacial deposits of Pleistocene Age.

WELL CHARACTERISTICS.--Drilled artesian well, diameter 6 in (15 cm), depth 56 ft (17 m), cased.

DATUM.--Altitude of land-surface datum is 1,190 ft (363 m). Measuring point: Top of shelter base, 2.95 ft (0.90 m) above land-surface datum.

PERIOD OF RECORD.--November 1948 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 25.71 ft (7.84 m) below land-surface datum, May 10, 1976; lowest, 35.97 ft (10.96 m) Apr. 4-6, 1951.

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	30.24	30.50	30.61	30.78	30.92	31.10	--	--	--	29.69	29.96	30.23
10	30.30	30.47	30.67	30.80	30.93	31.11	--	--	--	29.72	29.99	30.29
15	30.34	30.51	30.67	30.81	30.96	31.17	--	--	--	29.73	30.00	30.31
20	30.38	30.57	30.70	30.84	31.01	--	31.25	30.22	29.69	29.76	30.09	30.39
25	30.40	30.58	30.70	30.84	31.05	--	--	--	29.68	29.82	30.10	30.41
FOM	30.44	30.63	30.75	30.90	31.06	--	--	--	29.69	29.89	30.20	30.42

DELTA COUNTY

454446087090401. Local number, 39N 23W 28ACC.

LOCATION.--Lat 45°44'46", long 087°09'04", Hydrologic Unit 04030111, 3.5 mi (5.6 km) east of Escanaba.

Owner: M. Blake

AQUIFER.--Munising Sandstone of Cambrian Age.

WELL CHARACTERISTICS.--Drilled artesian well, diameter 5 in (13 cm), depth 530 ft (162 m).

DATUM.--Altitude of land-surface datum is 680 ft (207 m). Measuring point: Top of shelter base, 2.5 ft (0.8 m) above land-surface datum.

PERIOD OF RECORD.--July 1968 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 1.5 ft (0.5 m) below land-surface datum, May 6, 1960; lowest, 8.9 ft (2.7 m) Feb. 6, 1977.

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	6.18	5.63	--	--	6.06	6.22	--	5.84	6.49	7.48	7.31	7.18
10	5.89	5.44	5.77	--	6.01	6.22	--	5.92	6.74	7.63	7.50	7.24
15	5.93	5.50	5.68	--	6.04	6.23	--	5.88	6.88	7.45	7.67	6.67
20	5.97	5.60	5.52	--	6.13	6.24	5.43	6.03	6.98	--	7.43	6.61
25	6.05	5.58	5.48	--	6.14	6.22	5.59	6.16	7.09	7.13	7.22	--
EQM	6.10	--	--	--	6.19	5.89	5.66	6.30	7.31	7.30	7.13	6.54

DICKINSON COUNTY

460458087493901. Local number, 43N 28W 32ADAB.

LOCATION.--Lat 46°04'58", long 087°49'39", Hydrologic Unit 04030109, 6.25 mi (10.06 km) north of Felch.

Owner: State Department of Natural Resources.

AQUIFER.--Sand of Pleistocene Age.

WELL CHARACTERISTICS.--Augered water-table well, diameter, 1½ in (3.18 cm), depth 31 ft (9 m) screened 29 to 31 ft (8.8 to 9.4 m).

DATUM.--Altitude of land-surface datum is 1,160 ft (353 m). Measuring point: Hole in top of cap, 4.00 ft (1 m) above land-surface datum.

PERIOD OF RECORD.--October 1966 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level measured, 13.10 ft (3.99 m) below land-surface datum, May 17, 1972; lowest measured, 16.50 ft (5.03 m) Mar. 2, 1977.

[illegible]

## GROUND-WATER LEVELS

## EATON COUNTY

424435084365001. Local number, 4N 3W 12CDAD.

LOCATION.--Lat 42°44'35", long 084°36'50", Hydrologic Unit 04050004, north of M-43, 0.5 mi (0.8 km) west of Lansing.

Owner: F. Wheeler.

AQUIFER.--Saginaw Formation of Pennsylvanian Age.

WELL CHARACTERISTICS.--Drilled artesian well, diameter 6 in (15 cm), depth 381 ft (116 m), cased to 140 ft (43 m).

DATUM.--Land-surface datum is 862.91 ft (263.01 m) National Geodetic Vertical Datum of 1929. Measuring point: Plywood instrument shelf, 1.00 ft (0.30 m) above land-surface datum.

REMARKS.--Water levels affected by pumping.

PERIOD OF RECORD.--October 1953 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 67.5 ft (20.6 m) below land-surface datum, Nov. 23, 1953; lowest, 103.6 ft (31.6 m) Aug. 28, 1969.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
LOW VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	90.7	89.7	83.3	86.7	88.9	88.9	88.9	91.5	94.4	--	87.7	88.4
10	90.6	91.7	89.5	89.1	91.2	90.0	89.3	86.7	90.3	--	90.0	94.9
15	89.8	91.4	90.7	89.7	86.7	87.4	86.1	85.2	91.0	89.7	93.6	94.7
20	86.2	90.1	88.9	86.5	84.5	85.3	85.2	86.8	92.7	95.4	95.2	92.0
25	84.8	86.0	86.0	84.4	84.7	85.2	86.3	89.4	96.4	93.6	93.8	91.3
ECM	82.9	83.7	81.7	85.3	84.5	87.9	90.4	92.7	--	87.7	88.4	89.6

WTR YEAR 1978 MAX 80.2 JAN 2, 1978 MIN 95.8 JUL 21, 1978

## GENESEE COUNTY

425552083382801. Local number, 6N 7E 9DCCC.

LOCATION.--Lat 42°55'52", long 083°38'28", Hydrologic Unit 04080204, at Fisher Body Plant, Grand Blanc.

Owner: General Motors Corporation.

AQUIFER.--Saginaw Formation of Pennsylvanian Age.

WELL CHARACTERISTICS.--Drilled artesian well, diameter 10 in (25 cm), depth 385 ft (117 m), cased to 150 ft (46 m).

DATUM.--Land-surface datum is 837.0 ft (255.1 m) National Geodetic Vertical Datum of 1929. Measuring point: Base for recorder, 1.50 ft (0.46 m) above land-surface datum.

REMARKS.--Water levels affected by nearby pumping. Measurements made by Plant Water Department.

PERIOD OF RECORD.--January 1974 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 52.3 ft (15.9 m) below land-surface datum, Dec. 29, 1975; lowest, 87.0 ft (26.5 m) Jun. 29, 1977.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
LOW VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	63.0	58.0	56.4	58.4	67.6	65.0	61.0	61.0	69.4	65.0	73.2	70.5
10	59.8	57.7	56.4	59.0	63.3	63.7	61.8	60.2	66.7	73.4	72.3	76.5
15	58.8	57.7	56.0	59.7	63.0	63.5	62.2	59.8	64.5	78.7	74.2	70.7
20	58.3	57.0	55.7	60.4	63.0	62.9	60.9	61.6	68.0	85.5	68.8	66.2
25	57.8	57.6	58.3	60.7	62.9	62.8	59.6	62.6	67.1	83.4	68.0	64.7
ECM	59.0	57.0	--	72.9	--	61.5	60.1	66.8	74.3	76.3	67.9	63.4

WTR YEAR 1978 MAX 55.5 DEC 20, 1977 MIN 86.3 JUL 14, 1978

## GOGEBIC COUNTY

463046090092401. Local number, 48N 47W 34DAAA01.

LOCATION.--Lat 46°30'46", long 090°09'24", Hydrologic Unit 04010302, 4 mi (6 km) north of Ironwood on Route 505.

Owner: City of Ironwood.

AQUIFER.--Sand and gravel of Pleistocene Age.

WELL CHARACTERISTICS.--Drilled water table well, diameter 6 in (15 cm), depth 22 ft (7 m).

DATUM.--Altitude of land-surface datum is 1,190 ft (363 m). Measuring point: Top of recorder base, 2.40 ft (0.73 m) above land-surface datum.

REMARKS.--Water levels affected by nearby pumping.

PERIOD OF RECORD.--July 1961 to July 1978. Continuous recorder from 1961 to 1976.

EXTREMES FOR PERIOD OF RECORD.--Highest water level 0.7 ft (0.2 m) above land-surface datum, Apr. 9, 1969; lowest, 8.6 ft (2.6 m) below land-surface datum, March 1976.

## WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 6	2.62	DEC 14	3.35	MAR 15	5.06	MAY 9	3.01	JUN 13	4.47	JUL 25	4.47
NOV 9	3.06	JAN 25	4.50								



## GROUND-WATER LEVELS

433

## GRAND TRAVERSE COUNTY

443921085213501. Local number, 26N 9W 14ABAA.

LOCATION.--Lat 44°39'21", long 085°21'35", Hydrologic Unit 04060105, 5.5 mi (8.8 km) north of Fife Lake.

Owner: U.S. Geological Survey.

AQUIFER.--Sand of Pleistocene Age.

WELL CHARACTERISTICS.--Drilled water-table well, diameter 6 in (15 cm), depth 80 ft (24 m), PVC pipe and screen.

DATUM.--Altitude of land-surface datum is 960 ft (293 m). Measuring point: Plywood instrument shelf, 2.85 ft (0.87 m) above land-surface datum.

PERIOD OF RECORD.--June 1976 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 23.32 ft (7.11 m) below land-surface datum, June 17, 1976; lowest, 26.73 ft (8.15 m), Apr. 9, 1978.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
LOW VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	26.26	26.52	26.68	--	--	26.49	26.71	25.60	24.95	24.95	25.23	25.56
10	26.31	26.54	26.70	--	26.34	26.53	26.73	25.37	24.94	24.99	25.28	25.63
15	26.36	26.57	26.71	--	26.36	26.57	26.72	25.21	24.93	25.03	25.33	25.68
20	26.40	26.60	26.71	--	26.39	26.60	26.52	25.11	24.92	25.80	25.39	25.74
25	26.44	26.62	--	--	26.43	26.64	26.24	25.04	24.91	25.11	25.44	25.79
ECM	26.48	26.65	--	--	26.46	26.68	25.92	24.98	24.93	25.18	25.50	25.84

WTR YEAR 1978 MAX 24.90 JUN 25, 1978 MIN 26.73 APR 9, 1978

## HILLSDALE COUNTY

415236084313701. Local number 7S 2W 10EDDD.

LOCATION.--Lat 41°52'36", long 084°31'37", Hydrologic Unit 04100003, 2.5 mi (4.0 km) west of Pittsford on M-43.

Owner: State Department of Natural Resources.

AQUIFER.--Sand of Pleistocene Age.

WELL CHARACTERISTICS.--Augered water-table well, diameter 1½ in (3.2 cm), depth 20 ft (6 m), screened 17 to 20 ft (5 to 6 m).

DATUM.--Altitude of land-surface datum is 1,070 ft (326 m). Measuring point: Top of casing, 4.00 ft (1.22 m) above land-surface datum.

PERIOD OF RECORD.--December 1965 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level measured, 6.98 ft (2.13 m) below land-surface datum, May 22, 1978; lowest measured, 11.1 ft (3.38 m), Sept. 21, 1967

## WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 20	9.82	DEC 21	9.90	FEB 22	8.71	APR 24	7.21	JUN 23	9.04	AUG 16	9.15
NOV 21	9.65	JAN 20	8.68	MAR 24	7.64	MAY 22	6.98	JUL 26	8.71	SEP 18	9.30

## INGHAM COUNTY

424502084331301. Local number, 4N 2W 9BDAD.

LOCATION.--Lat 42°45'02", long 084°33'13", Hydrologic Unit 04050004, at North Grand River Avenue and Josephine Streets, Lansing.

Owner: City of Lansing.

AQUIFER.--Saginaw Formation of Pennsylvanian Age.

WELL CHARACTERISTICS.--Drilled artesian well, diameter 14 in (36 cm), depth 395 ft (120 m), cased to 49 ft (15 m).

DATUM.--Land-surface datum is 828.81 ft (252.62 m) National Geodetic Vertical Datum of 1929. Measuring point: Plywood shelter base, 9.4 ft (2.9 m) below land-surface datum.

REMARKS.--Water levels affected by regional pumping.

PERIOD OF RECORD.--December 1929 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 15.63 ft (4.76 m) below land-surface datum, Mar. 26, 1931; lowest, 179.4 ft (54.7 m) Apr. 29, 1968.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
LOW VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	98.6	101.1	98.4	94.0	99.3	98.9	98.9	95.7	--	106.3	110.5	114.7
10	97.6	100.1	97.4	95.6	99.2	99.3	98.0	--	--	109.5	112.0	118.6
15	98.4	100.4	97.8	96.4	99.0	100.0	98.2	93.8	102.4	111.0	113.5	119.2
20	99.0	100.2	96.4	97.2	98.8	100.6	97.4	--	103.7	114.4	114.1	119.3
25	100.2	98.1	94.6	97.7	97.7	101.1	97.3	--	105.7	114.1	116.0	118.2
ECM	101.0	98.5	93.4	99.0	97.5	99.6	95.7	--	109.5	111.4	115.3	117.4

WTR YEAR 1978 MAX 92.6 MAY 1978 MIN 120.0 SEP 22, 1978

## GROUND-WATER LEVELS

## IRON COUNTY

460455088412901. Local number, 43N 35W 33EDAD.

LOCATION.--Lat 46°04'55", long 088°41'29", Hydrologic Unit 04030106, 1.3 mi (2.1 km) south of junction U.S. 2 on highway M-73.

Owner: State Highway Department.

AQUIFER.--Sand and gravel of Pleistocene Age.

WELL CHARACTERISTICS.--Driven water-table well, diameter 1½ in (3.2 cm), depth 12 ft (4 m), screened 9 to 12 ft (3 to 4 m).

DATUM.--Altitude of land-surface datum is 1,520 ft (463 m). Measuring point: Top of casing, 2.05 ft (0.62 m) above land-surface datum.

REMARKS.--Measured by Wisconsin-Michigan Power Company.

PERIOD OF RECORD.--September 1948 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level measured, 1.66 ft (0.51 m) below land-surface datum, June 1, 1973; lowest measured, 8.44 ft (2.57 m) Mar. 15, 1949.

## WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 31	5.82	JAN 3	5.76	FEB 28	6.26	MAY 1	5.45	JUN 30	5.13	SEP 29	5.42
NOV 28	5.60	31	6.02	APR 3	6.46	JUN 1	5.02	JUL 31	5.31		

## JACKSON COUNTY

421435084234801. Local number, 3S 1W 28DBA.

LOCATION.--Lat 42°14'35", long 084°23'48", Hydrologic Unit 04050004, at end of Hamburg Street, Jackson.

Owner: City of Jackson.

AQUIFER.--Saginaw Formation of Pennsylvanian Age.

WELL CHARACTERISTICS.--Drilled artesian well, diameter 12 in (30 cm), depth 400 ft (122 m), open bottom.

DATUM.--Altitude of land-surface datum is 935 ft (285 m). Measuring point: Plywood recorder shelf, +4.00 ft (1.22 m) above land-surface datum.

REMARKS.--Water levels affected by pumping.

PERIOD OF RECORD.--August 1966 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 16.3 ft (5.0 m) below land-surface datum, Jan. 3, 1971; lowest, 68.8 ft (21.0 m) Jun. 30, 1971.

## WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

## LOW VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	37.8	39.7	34.7	33.3	32.8	30.4	34.4	--	--	32.8	44.0	41.3
10	34.8	39.5	35.0	33.0	37.5	34.4	31.6	--	--	33.0	44.7	46.0
15	36.2	36.1	38.4	29.0	36.7	31.5	34.8	--	--	36.6	46.4	44.0
20	37.3	33.3	35.9	38.1	32.8	32.4	34.4	--	--	46.5	45.5	45.4
25	36.4	30.0	29.8	35.9	35.5	32.6	34.8	40.2	--	42.9	49.3	41.6
ECM	35.1	34.2	27.2	33.2	34.2	34.8	32.8	--	43.3	41.1	45.1	40.9

WTR YEAR 1978 MAX 21.4 JAN 2, 1978 MIN 49.2 AUG 25, 1978

## KALAMAZOO COUNTY

421641085350601. Local number, 2S 11W 22CDBB.

LOCATION.--Lat 42°16'41", long 085°35'06", Hydrologic Unit 04050003, at southwest corner Crosstown Parkway and Stockbridge Avenue, Kalamazoo.

Owner: City of Kalamazoo.

AQUIFER.--Glacial deposits of Pleistocene Age.

WELL CHARACTERISTICS.--Drilled water-table well, diameter 4 in (10 cm), depth 137 ft (42 m), screened 134 to 137 ft (41 to 42 m).

DATUM.--Land-surface datum is 764.7 ft (233.1 m) National Geodetic Vertical Datum of 1929. Measuring point: Top of casing, 2.00 ft (0.61 m) above land surface datum.

REMARKS.--Water levels affected by nearby pumping.

PERIOD OF RECORD.--August 1960 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 4.81 ft (1.47 m) below land-surface datum, Feb. 5, 1975; lowest, 31.08 ft (9.47 m) Aug. 19, 1961.

## WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

## LOW VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	--	10.69	9.43	8.63	8.49	8.51	8.27	8.35	8.88	9.14	9.45	9.99
10	--	10.46	9.41	8.61	8.47	8.49	8.20	8.40	8.98	9.16	9.53	10.12
15	--	10.42	9.26	8.63	8.46	8.45	8.13	8.38	9.05	9.20	9.65	10.20
20	11.02	10.28	9.11	8.59	8.48	8.40	8.10	8.45	9.10	9.23	9.73	10.20
25	10.92	10.05	9.08	8.55	8.52	8.37	8.20	8.60	9.10	9.28	9.82	10.22
ECM	10.81	9.58	8.77	8.50	8.52	8.32	8.30	8.75	9.12	9.44	9.93	10.24

WTR YEAR 1978 MAX 7.95 APR 1978 MIN 11.02 OCT 20, 1978

## GROUND-WATER LEVELS

435

## KALAMAZOO COUNTY

421325085404801. Local number, 3S 12W 11E DAD.

LOCATION.--Lat 42°13'25", long 085°40'48", Hydrologic Unit 04050003, at Kalamazoo Community College.

Owner: City of Kalamazoo.

AQUIFER.--Glacial deposits of Pleistocene Age.

WELL CHARACTERISTICS.--Drilled artesian well, diameter 3 in (7.6 cm), depth 248 ft (76 m).

DATUM.--Altitude of land-surface is 880 ft (268 m). Measuring point: Top of shelter base, 4.0 ft (1.2 m) above land-surface datum.

PERIOD OF RECORD.--March 1961 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, +2.98 ft (+0.91 m) above land-surface datum, Sept. 4, 1969; lowest, 1.04 ft (0.32 m) below land-surface datum, Aug. 4, 1977.

## WATER LEVEL, IN FEET ABOVE AND BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

## LOW VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	-0.10	-0.45	-0.32	--	--	--	--	--	+0.10	+1.33	+0.64	+0.48
10	-0.14	--	-0.40	--	--	--	--	--	+0.03	+0.80	+0.33	+0.17
15	-0.19	--	-0.35	--	--	--	--	--	+0.53	+0.60	-0.07	+1.13
20	-0.21	--	+0.42	--	+0.74	--	+1.17	+1.23	+0.70	+0.24	+0.92	+1.32
25	-0.23	--	+0.47	+0.92	--	+0.81	--	+1.25	+1.05	+0.85	+0.74	--
BOM	-0.34	-0.33	--	--	--	--	--	+0.75	+1.40	+0.95	+1.15	+1.45

WTR YEAR 1978 MAX +1.48 SEP 27, 1978 MIN -0.45 NOV 5, 1977

## KENT COUNTY

425305085432001. Local number, 6N 12W 27BBBA.

LOCATION.--Lat 42°53'05", long 085°43'20", Hydrologic Unit 04050006, at 44th Street and Byron Avenue, Wyoming.

Owner: City of Wyoming.

AQUIFER.--Marshall Formation of Mississippian Age.

WELL CHARACTERISTICS.--Drilled artesian well, diameter 14 in (36 cm), depth 265 ft (81 m), cased to 207 ft (63 m).

DATUM.--Land-surface datum is 707.24 ft (215.57 m) National Geodetic Vertical Datum of 1929. Measuring point: Top of shelter base, 1.50 ft (0.46 m) above land-surface datum.

REMARKS.--Water levels affected by pumping.

PERIOD OF RECORD.--October 1962 to September 11, 1978.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 46.38 ft (14.14 m) below land-surface datum, May 21, 1974; lowest, 56.05 ft (17.08 m) Aug. 8, 1964.

## WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

## LOW VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	48.95	49.17	49.03	48.89	49.20	49.30	49.06	48.90	49.00	48.73	49.13	49.81
10	48.94	49.15	49.24	49.04	49.20	49.30	49.05	48.88	49.20	48.81	50.75	50.08
15	49.08	48.96	49.09	49.09	49.15	49.30	49.05	48.77	48.95	49.06	49.87	
20	49.13	49.17	49.00	49.10	49.15	49.10	48.79	48.88	48.86	49.55	49.87	
25	49.01	49.16	48.98	48.95	49.35	49.19	48.75	49.26	49.10	49.56	49.75	
BOM	49.14	49.05	48.79	49.05	49.20	49.09	48.78	49.53	48.88	49.55	49.90	

WTR YEAR 1978 MAX 48.58 JAN 1, 1978 MIN 50.09 SEP 9, 1978

## KENT COUNTY

425030085434901. Local number, 5N 12W 4DCCD.

LOCATION.--Lat 42°50'30", long 085°43'49", Hydrologic Unit 04050006, 2.1 mi (3.4 km) north of Byron Center and 0.4 mi (0.6 km) west of Byron Center Road.

Owner: City of Wyoming.

AQUIFER.--Sand and gravel of Pleistocene Age.

WELL CHARACTERISTICS.--Drilled artesian well, diameter 6 in (15 cm), depth 86 ft (26 m).

DATUM.--Land-surface datum is 685.97 ft (209.08 m) National Geodetic Vertical Datum of 1929. Measuring point: Top of shelter base, 2.50 ft (0.76 m) above land-surface datum.

REMARKS.--Monthly measurements begun August 1978.

PERIOD OF RECORD.--October 1962 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 8.28 ft (2.52 m) below land-surface datum, Apr. 14, 1974; lowest, 12.91 ft (3.93 m) Aug. 19, 1964.

## WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

## LOW VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	11.26	11.27	10.99	--	10.72	10.95	--	10.13	--	--	--	--
10	11.22	11.22	10.95	--	--	10.96	--	10.22	--	--	--	11.22
15	11.23	11.18	10.94	--	10.85	10.74	--	10.01	--	--	--	--
20	11.23	11.17	10.76	10.69	10.88	10.50	9.75	--	--	--	10.66	--
25	11.24	11.13	--	10.71	10.92	--	9.87	--	--	--	--	--
BOM	11.27	11.16	--	10.73	10.93	--	9.99	--	--	--	--	--

## GROUND-WATER LEVELS

## LENAWEE COUNTY

420246084150601. Local number 5S 1E 12DDED.

LOCATION.--Lat 42°02'46", long 084°15'06", Hydrologic Unit 04100002, 2 mi (3 km) west of Cambridge Junction in the Onsted State Game Area.

Owner: State Department of Natural Resources.

AQUIFER.--Sand of Pleistocene Age.

WELL CHARACTERISTICS.--Drilled water-table well, diameter 1½ in (3.2 cm), depth 39 ft (12 m), screened 36 to 39 ft (11 to 12 m).

DATUM.--Altitude of land-surface datum is 1,000 ft (305 m). Measuring point: Top of casing, 3.00 ft (0.91 m) above land-surface datum.

PERIOD OF RECORD.--December 1965 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level measured, 16.33 ft (4.98 m) below land-surface datum, Apr. 26, 1977; lowest measured, 19.33 ft (5.89 m) Sept. 2, 1971.

## WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 25	17.58	DEC 27	16.89	FEB 24	17.16	APR 26	16.29	JUN 27	16.91	SEP 18	17.67
NOV 23	17.39	JAN 25	17.18	MAR 28	16.48	MAY 24	16.42	JUL 28	17.50		

## LIVINGSTON COUNTY

422853083402801. Local number, 1N 6E 13D8AB.

LOCATION.--Lat 42°28'53", long 083°40'28", Hydrologic Unit 04090005, 2 mi (3 km) northwest of South Lyon on Twelve Mile Road.

Owner: American Aggregate Corporation.

AQUIFER.--Glacial deposits of Pleistocene Age.

WELL CHARACTERISTICS.--Drilled water-table well, diameter 2 in (5 cm), depth 29 ft (9 m), 1½ in (3.2 cm) diameter screen.

DATUM.--Altitude of land-surface datum is 930 ft (283 m). Measuring point: Plywood instrument shelf, 2.50 ft (0.76 m) above land-surface datum.

PERIOD OF RECORD.--April 1970 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 12.1 ft (3.7 m) below land-surface datum, Apr. 22, 1974; lowest, 18.07 ft (5.51 m) Feb. 26, 1972.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
LOW VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	17.51	17.57	17.65	17.64	17.53	17.52	16.46	15.67	15.83	16.20	16.22	16.99
10	17.56	17.49	17.73	17.61	17.53	17.50	16.21	15.76	15.58	16.20	16.22	17.05
15	17.56	17.47	17.74	17.61	17.53	17.47	15.92	15.76	15.72	16.15	16.48	16.92
20	17.67	17.50	17.69	17.62	17.53	17.37	15.78	15.64	15.88	16.03	16.59	17.08
25	17.75	17.51	17.65	17.60	17.52	16.95	15.86	15.55	16.05	16.17	16.42	17.26
ECM	17.74	17.63	17.65	17.56	17.52	16.72	15.78	15.74	15.92	16.39	16.46	17.14

WTR YEAR 1978 MAX 15.53 MAY 25, 1978 MIN 17.75 OCT 24, 1977

## MACKINAC COUNTY

460321084354801. Local number, 42N 2W 7AABB.

LOCATION.--Lat 46°03'21", long 084°35'48", Hydrologic Unit 04070002, 2 mi (3 km) north of Pontchartrain Shores at Pontchartrain and St. Ignace Roads.

Owner: U.S. Forest Service.

AQUIFER.--Manistique Dolomite of Silurian Age.

WELL CHARACTERISTICS.--Drilled water-table well, diameter 6 in (15 cm), depth 102 ft (31 m).

DATUM.--Altitude of land-surface datum is 650 ft (198 m). Measuring point: Top of shelter floor, 2.3 ft (0.7 m) above land-surface datum.

PERIOD OF RECORD.--June 1956 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 13.1 ft (4.0 m) below land-surface datum, May 11, 1960; lowest, 32.3 ft (9.8 m) Feb. 7, 1977.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
LOW VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	25.4	22.8	20.9	23.7	25.8	26.7	25.5	20.9	22.1	25.2	27.2	28.3
10	22.0	22.0	22.0	24.1	26.0	26.8	22.4	21.5	22.7	25.6	27.5	28.5
15	22.7	21.9	22.8	24.5	26.1	27.0	21.0	16.1	23.3	26.0	27.8	27.8
20	23.6	22.3	22.9	24.9	26.3	27.1	18.0	18.2	23.8	26.3	28.1	27.6
25	24.1	20.9	22.3	25.1	26.5	27.3	18.2	19.9	24.3	26.6	28.2	27.7
ECM	24.6	22.1	23.3	25.5	26.6	27.0	19.7	21.3	24.8	26.9	28.1	27.5

WTR YEAR 1978 MAX 15.9 MAY 14, 1978 MIN 28.5 SEP 9, 1978

## MARQUETTE COUNTY

462938087475901. Local number, 47N 28W 30CDC.

LOCATION.--Lat 46°29'38", long 087°47'59", Hydrologic Unit 04020105, 4.8 mi (7.7 km) west of Ishpeming on U.S. Highway 41 and M-28.

Owner: Ely Township.

AQUIFER.--Sand and gravel of Pleistocene Age.

WELL CHARACTERISTICS.--Drilled artesian well, diameter 8 in (20 cm), depth 72 ft (22 m), screened 68 to 72 ft (19 to 22 m).

DATUM.--Land-surface datum is 1,571.99 ft (479.14 m) National Geodetic Vertical Datum of 1929. Measuring point: Top of recorder base, 3.0 ft (0.9 m) above land-surface datum.

REMARKS.--Federal key well.

PERIOD OF RECORD.--August 1961 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 9.74 ft (2.97 m) below land-surface datum, May 13, 1974; lowest, 19.26 ft (5.87 m) Apr. 10-11, 1964.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
LOW VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	16.77	16.13	16.01	--	16.94	17.35	--	14.82	14.35	14.52	14.63	13.33
10	16.67	16.06	16.14	--	17.01	17.44	--	14.76	14.39	14.65	14.72	13.47
15	16.29	16.06	16.16	16.67	17.08	17.52	--	14.65	14.38	14.73	14.81	11.73
20	16.06	16.10	16.21	16.70	17.14	17.60	--	14.49	14.30	14.70	14.83	11.84
25	16.01	16.01	16.28	16.73	17.22	17.66	--	14.46	14.30	14.52	14.47	12.06
EQM	16.04	15.98	16.40	16.85	17.27	--	15.05	14.38	14.43	14.53	13.30	--

WTR YEAR 1978 MAX 11.68 SEP 14, 1978 MIN 17.70 MAR 27, 1978

## MENOMINEE COUNTY

453504087331301. Local number, 37N 26W 19DADA.

LOCATION.--Lat 45°35'04", long 087°33'13", Hydrologic Unit 04030108, on Highway U.S. 41 at Carney.

Owner: State Highway Department.

AQUIFER.--Trenton Limestone and Black River Formation of Middle Ordovician Age.

WELL CHARACTERISTICS.--Water-table well, diameter 4 in (10 cm), depth 17 ft (5 m), cased.

DATUM.--Altitude of land-surface datum is 800 ft (244 m). Measuring point: Top of 2 in (5 cm) reducing nipple, 1.26 ft (0.38 m) above land-surface datum.

PERIOD OF RECORD.--September 1959 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level measured, 3.59 ft (1.09 m) below land-surface datum, May 10, 1973; lowest measured, 8.62 ft (2.63 m) Jan. 17, 1977.

## WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
NOV 9	3.98	DEC 29	4.35	MAR 14	4.80	MAY 30	4.49	AUG 31	4.71

## MONROE COUNTY

415235083414001. Local number, 7S 6E 15ADB.

LOCATION.--Lat 41°52'55", long 083°41'40", Hydrologic Unit 04100002, 1.5 mi (2.4 km) southeast of Petersburg on Teal Road.

Owner: State Department of Natural Resources.

AQUIFER.--Sand of Pleistocene Age.

WELL CHARACTERISTICS.--Drilled water-table well, diameter 1½ in (3.2 cm), depth 17 ft (5 m), screened 14 to 17 ft (4 to 5 m).

DATUM.--Altitude of land-surface datum is 675 ft (206 m). Measuring point: Top of casing, 4.00 ft (1.22 m) above land-surface datum.

PERIOD OF RECORD.--December 1965 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level measured, 3.00 ft (0.91 m) below land-surface datum, Feb. 14, 1966; lowest measured, 6.69 ft (2.04 m), Dec. 29, 1976.

## WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 3	5.58	DEC 5	5.40	MAR 27	4.74	JUN 5	4.46	AUG 9	5.78	SEP 13	6.64
NOV 3	5.59	JAN 9	5.03	APR 25	4.10	JUL 12	5.08				





## OGEMAW COUNTY

442514084164702. Local number, 23N 1E 2BAAA.

LOCATION.--Lat 44°25'14", long 084°16'47", Hydrologic Unit 04070007, 8 mi (13 km) east of Rose City on south side of Rose City Road.

Owner: Ogemaw County Road Commission.

AQUIFER.--Sand of Pleistocene Age.

WELL CHARACTERISTICS.--Drilled water-table well, diameter 1½ in (3.8 cm), depth 20 ft (6 m).

DATUM.--Altitude of land-surface datum is 1,265 ft (386 m). Measuring point: Top of casing, 2.30 ft (0.70 m) above land-surface datum.

PERIOD OF RECORD.--November 1968 to October 1971. April 1974 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level measured, 7.62 ft (2.32 m) below land-surface datum, Apr. 13, 1976; lowest measured, 13.6 ft (4.1 m) December 1972.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 26	11.85	APR 20	10.48	JUL 26	10.80

## ONTONAGON COUNTY

465002089321601. Local number, 51N 41W 8BDEC.

LOCATION.--Lat 46°50'02", long 089°32'16", Hydrologic Unit 04020101, 325 ft (99 m) south of M-64, 1.5 mi (2.4 km) east of Silver City.

Owner: State Corrections Department.

AQUIFER.--Freda Sandstone of Keweenaw Age.

WELL CHARACTERISTICS.--Drilled artesian well, diameter 6 in (15 cm), depth 100 ft (30 m), cased to 32 ft (10 m).

DATUM.--Altitude of land-surface datum is 620 ft (189 m). Measuring point: Plywood instrument shelf, 3.50 ft (1.07 m) above land-surface datum.

PERIOD OF RECORD.--October 1958 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level measured, 8.20 ft (2.50 m) below land-surface datum, Apr. 15, 1959; lowest measured, 21.82 ft (6.65 m) Dec. 15, 1976.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 4	12.41	JAN 23	10.45	MAY 23	9.52	AUG 29	12.72	SEP 12	13.41

## PRESQUE ISLE

451634083441801. Local number, 33N 6E 8BBBB.

LOCATION.--Lat 45°16'34", long 083°44'18", Hydrologic Unit 04070006, south side of Grand Lake Highway, 2 mi (3 km) west and 1 mi (2 km) north of Posen.

Owner: A. Styma.

AQUIFER.--Traverse Group.

WELL CHARACTERISTICS.--Drilled artesian well, diameter 6 in (15 cm), depth 61 ft (19 m).

DATUM.--Altitude of land-surface datum 815 ft (248 m). Measuring point: Top of casing, 0.5 ft (0.2 m) above land-surface datum.

PERIOD OF RECORD.--December 1959 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level measured, 5.42 ft (1.65 m) below land-surface datum, Apr. 3, 1967; lowest measured, 16.83 ft (5.13 m) Mar. 5, 1963.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
JAN 17	9.33	APR 18	5.54	JUL 18	12.00

## GROUND-WATER LEVELS

## ROSCOMMON COUNTY

442722084350701. Local number, 24N 2W 20BABA.

LOCATION.--Lat 44°27'22", long 084°35'07", Hydrologic Unit 04070007, 2 mi (3 km) south of Roscommon and 0.5 mi (0.8 km) east of highway M-18 on highway M-103.

Owner: State Department of Natural Resources.

AQUIFER.--Sand of Pleistocene Age.

WELL CHARACTERISTICS.--Jetted water-table well, diameter 8 in (20 cm), depth 14 ft (4 m), open bottom.

DATUM.--Land-surface datum is 1,145.30 ft (349.09 m) National Geodetic Vertical Datum of 1929. Measuring point: Top of casing, 2.50 ft (0.76 m) above land-surface datum.

REMARKS.--Federal key well.

PERIOD OF RECORD.--December 1934 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 2.30 ft (0.70 m) below land-surface datum, Apr. 23, 1971; lowest, 6.23 ft (1.90 m) Dec. 6-11, 1949.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
LOW VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	5.45	5.31	5.14	5.03	5.19	5.38	5.28	4.00	4.32	4.69	5.20	5.45
10	5.43	5.31	5.10	5.04	5.23	5.41	--	4.10	4.35	4.80	5.28	5.50
15	5.36	5.31	--	5.05	5.28	5.43	--	4.00	--	4.92	5.38	5.10
20	5.31	5.30	5.08	5.08	5.32	5.46	4.10	3.99	4.30	5.01	5.42	4.45
25	5.30	5.26	5.04	5.11	5.36	5.43	3.99	4.10	4.46	5.07	5.48	4.36
ECM	5.31	5.25	5.02	5.14	5.37	5.39	3.95	4.23	4.57	5.15	5.32	4.41
WTR YEAR 1978	MAX	3.95	APR 29, 1978	MIN	5.51	SEP 11, 1978						

## SANILAC COUNTY

433439082523601. Local number, 13N 13E 12ADAA.

LOCATION.--Lat 43°34'39", long 082°52'36", Hydrologic Unit 04090001, on Wheatland Road 3 mi (5 km) east and .75 mi (1.21 km) north of Argyle.

Owner: U.S. Geological Survey.

AQUIFER.--Marshall Formation of Mississippian Age.

WELL CHARACTERISTICS.--Drilled artesian observation well, diameter 6 in (15 cm), depth 130 ft (40 m), cased with plastic pipe to 48 ft (15 m), open bottom.

DATUM.--Altitude of land-surface datum is 805 ft (245 m). Measuring point: Plywood instrument shelf, 2.5 ft (0.8 m) above land-surface datum.

PERIOD OF RECORD.--October 15, 1976 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 17.66 ft (5.38 m) below land-surface datum, Apr. 6, 1978; lowest 22.33 ft (6.81 m) Sep. 10, 1978.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
LOW VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	20.58	20.48	19.29	19.30	19.15	19.40	17.79	--	--	--	21.08	22.19
10	20.44	20.31	19.47	19.34	19.17	19.37	17.79	--	--	--	21.26	22.33
15	20.39	20.04	19.24	19.35	19.26	19.21	17.98	--	--	20.28	21.59	22.07
20	20.39	20.05	18.85	19.40	19.31	18.95	17.90	--	--	20.55	--	21.99
25	20.40	19.70	18.90	19.35	19.38	18.23	--	--	--	20.62	21.76	22.00
ECM	20.44	19.71	19.22	19.11	19.36	17.98	--	--	--	20.87	21.96	22.01
WTR YEAR 1978	MAX	17.66	APR 6, 1978	MIN	22.33	SEP 10, 1978						

## SCHOOLCRAFT COUNTY

461720085565201. Local number, 45N 13W 16CCCB.

LOCATION.--Lat 46°17'20", long 085°56'52", Hydrologic Unit 04060106, at headquarters building Seney Wildlife refuge.

Owner: U.S. Fish and Wildlife Service.

AQUIFER.--Limestones of Upper Ordovician Age.

WELL CHARACTERISTICS.--Drilled artesian well, diameter 4 in (10 cm), depth 151 ft (46 m), cased to 65 ft (20 m).

DATUM.--Altitude of land-surface datum is 710 ft (216 m). Measuring point: Top of casing, 3.60 ft (1.10 m) below land-surface datum.

PERIOD OF RECORD.--June 1952 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 4.64 ft (1.41 m) below land-surface datum, Apr. 13, 1971; lowest, 6.50 ft (1.98 m) Oct. 23, 1963.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
LOW VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	5.71	5.40	5.44	5.23	5.15	5.10	5.20	5.39	--	5.60	5.52	5.33
10	5.60	5.23	5.46	5.17	5.11	5.10	5.15	--	--	5.61	5.58	--
15	5.60	5.40	5.38	5.20	5.10	5.18	5.19	--	--	5.64	5.62	5.30
20	5.63	5.53	5.29	5.22	5.10	5.12	5.39	--	--	5.65	5.47	5.30
25	5.64	5.47	5.23	5.19	5.10	5.19	5.40	--	5.49	5.50	5.49	5.30
ECM	5.67	5.49	5.30	5.13	5.10	5.24	5.41	--	5.52	5.56	5.39	--
WTR YEAR 1978	MAX	5.00	JAN 26, 1978	MIN	5.75	OCT 6, 1977						

## VAN BUREN COUNTY

421435085591001. Local number, 3S 14W 6BAAD.

LOCATION.--Lat 42°14'35", long 085°59'10", Hydrologic Unit 04050001, 5 mi (8 km) northwest of Paw Paw at the southwest corner of 45th and 48th Streets.

Owner: Rex Martin.

AQUIFER.--Sand of Pleistocene Age.

WELL CHARACTERISTICS.--Drilled artesian well, diameter 1½ in (3.8 cm), depth 59 ft (18 m), screened 56 to 59 ft (17 to 18 m).

DATUM.--Altitude of land-surface datum is 740 ft (226 m). Measuring point: Top of casing, 0.5 ft (.2 m) above land-surface datum.

PERIOD OF RECORD.--May 1963 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level measured, 37.22 ft (11.34 m) below land-surface datum, May 30, 1974; lowest measured, 43.28 ft (13.19 m) Nov. 20, 1964.

## WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 19	40.70	DEC 20	40.16	MAY 22	38.72	JUL 26	39.37	AUG 17	39.78	SEP 20	39.81
NOV 18	40.21	JAN 18	40.05	JUN 22	39.34						

## WASHTENAW COUNTY

421228083331601. Local number, 3S 7E 24CACA.

LOCATION.--Lat 42°12'28", long 083°33'16", Hydrologic Unit 04090005, at Ypsilanti Township waterworks on Bridge Street.

Owner: Ypsilanti Township.

AQUIFER: Sand of Pleistocene Age.

WELL CHARACTERISTICS.--Drilled water-table well, diameter 4 in (10 cm), depth 80 ft (24 m), screened 77 to 80 ft (23 to 24 m).

DATUM.--Land-surface datum is 665.56 ft (202.86 m) National Geodetic Vertical Datum of 1929. Measuring point: Top of coupling, 3.00 ft (0.91 m) above land-surface datum.

REMARKS.--Water level affected by nearby pumping.

PERIOD OF RECORD.--July 1943 to June 1945, December 1949 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 5.79 ft (1.76 m) below land-surface datum, Jan. 5, 1950; lowest, 22.66 ft (6.91 m) Feb. 13, 1971.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978  
LOW VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	13.82	15.62	14.37	14.25	14.53	14.72	13.18	--	--	15.10	18.02	17.84
10	13.81	15.50	14.75	14.42	14.41	14.51	13.05	--	--	16.00	17.82	--
15	13.97	15.35	14.46	14.48	14.45	14.47	13.60	--	--	16.70	17.91	--
20	14.69	15.09	14.07	14.45	14.45	14.19	13.63	--	--	17.28	18.06	17.42
25	15.25	14.72	14.01	14.32	14.58	13.25	13.45	12.92	--	17.59	17.88	17.30
EOM	15.46	14.66	14.16	14.57	14.58	13.01	--	--	15.85	17.96	17.90	17.06
WTR YEAR 1978	MAX	12.41	MAY 1978	MIN	18.07	AUG 21, 1978						

## WEXFORD COUNTY

441503084242201. Local number, 21N 9W 4ABBC.

LOCATION.--Lat 44°15'03", long 084°24'22", Hydrologic Unit 04060102, at Pine and Lake Streets, Cadillac.

Owner: City of Cadillac.

AQUIFER.--Glacial deposits of Pleistocene Age.

WELL CHARACTERISTICS.--Drilled artesian well, diameter 6 in (15 cm), reported depth 277 ft (84 m).

DATUM.--Land-surface datum is 1,291.10 ft (393.53 m) National Geodetic Vertical Datum of 1929. Measuring point: Top of shelter base, 4.13 ft (1.26 m) above land-surface datum.

REMARKS.--Water level affected by nearby pumping.

PERIOD OF RECORD.--March 1949 to current year.

EXTREMES FOR PERIOD OF RECORD.--Highest water level, 19.66 ft (5.99 m) below land-surface datum, Oct. 20, 1976; lowest, 27.59 ft (8.41 m) June 30, 1964.

## WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1977 TO SEPTEMBER 1978

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 2	21.69	APR 12	22.10	AUG 9	25.69

## TEMPERATURE OF GROUND WATER

Temperatures of ground water are measured as part of a state-wide water resource investigation in cooperation with Michigan Department of Natural Resources. The purpose of these measurements is to determine the natural ground-water temperature of selected points throughout the State. These data, when combined with existing theory, can be used to estimate ground-water temperatures at moderate depth at any point in the State. Measurements of temperature were made by means of "lazy" thermometers (Heath, 1964), which remain in the well except when being read.

## TEMPERATURE (°C) OF GROUND WATER AT INDICATED DEPTH

DATE	WATER TEMPER- ATURE (°C)	DATE	WATER TEMPER- ATURE (°C)	DATE	WATER TEMPER- ATURE (°C)
ALGER COUNTY, 45N19W25BDCD1 (LAT 46°16'08", LONG 86°37'38") DEPTH 66 ft (20 m)					
NOV 10, 1977	6.0	FEB 10, 1978	7.5	JUN 13 . . .	6.5
SEP 28 . . .	10.0				
CLINTON COUNTY, 06N02W16DDAD1 (LAT 42°54'10", LONG 84°32'35") DEPTH 23 ft (7 m)					
OCT 17, 1977	12.0	JAN 23 . . .	10.5	MAY 16 . . .	8.5
OCT 26 . . .	12.0	FEB 15 . . .	9.5	MAY 23 . . .	8.5
NOV 16 . . .	12.0	FEB 21 . . .	10.0	JUN 19 . . .	9.0
NOV 23 . . .	12.0	MAR 20 . . .	9.0	JUL 24 . . .	9.5
DEC 16 . . .	11.5	MAR 24 . . .	9.0	AUG 24 . . .	10.5
DEC 23 . . .	11.5	APR 20 . . .	8.0	SEP 25 . . .	11.0
JAN 17, 1978	10.0				
DICKINSON COUNTY, 43N28W32ADAB1 (LAT 46°04'59", LONG 87°49'37") DEPTH 31 ft (9 m)					
DEC 08, 1977	8.0	FEB 02, 1978	7.5	MAR 03 . . .	7.0
HILLSDALE COUNTY, 07S02W10BDDD1 (LAT 41°52'36", LONG 84°31'37") DEPTH 20 ft (6 m)					
OCT 20, 1977	10.0	FEB 22 . . .	8.5	JUN 23 . . .	8.5
NOV 21 . . .	10.5	MAR 24 . . .	9.5	JUL 26 . . .	9.0
DEC 21 . . .	9.5	APR 24 . . .	9.5	AUG 16 . . .	9.0
JAN 20, 1978	9.0	MAY 22 . . .	9.0	SEP 18 . . .	9.5
INGHAM COUNTY, 03N01E07DDCA1 (LAT 42°39'34", LONG 84°21'49") DEPTH 41 ft (12 m)					
OCT 13, 1977	11.5	FEB 14 . . .	9.5	JUN 15 . . .	10.0
NOV 15 . . .	11.0	MAR 15 . . .	9.5	JUL 13 . . .	10.5
DEC 14 . . .	10.5	APR 17 . . .	9.5	AUG 17 . . .	11.5
JAN 16, 1978	10.0	MAY 15 . . .	9.5	SEP 25 . . .	12.0
LENAWEE COUNTY, 05S01E12DDBD1 (LAT 42°02'46", LONG 84°15'06") DEPTH 39 ft (12 m)					
OCT 25, 1977	9.5	FEB 24 . . .	9.5	JUN 27 . . .	9.5
NOV 23 . . .	9.5	MAR 28 . . .	9.5	JUL 28 . . .	9.5
DEC 27 . . .	9.5	APR 26 . . .	9.5	SEP 18 . . .	9.5
JAN 25, 1978	9.5	MAY 24 . . .	9.5		
MARQUETTE COUNTY, 46N29W02ADDA1 (LAT 46°29'59", LONG 87°53'13") DEPTH 19 ft (6 m)					
OCT 11, 1977	11.0	MAY 04 . . .	4.5	JUL 12 . . .	7.0
JAN 25, 1978	6.0	JUN 06 . . .	5.0	SEP 08 . . .	10.5
MAR 24 . . .	5.0	JUN 14 . . .	5.5		



## TEMPERATURE OF GROUND WATER

443

## TEMPERATURE (°C) OF GROUND WATER AT INDICATED DEPTH--CONTINUED

DATE	WATER TEMPER- ATURE (°C)	DATE	WATER TEMPER- ATURE (°C)	DATE	WATER TEMPER- ATURE (°C)
MENOMINEE COUNTY, 37N26W19DADA1 (LAT 45°35'00", LONG 87°33'15") DEPTH 17 ft (5 m)					
NOV 09, 1977	11.0	MAR 14, 1978	6.5	AUG 31 . . .	10.5
DEC 29 . . .	8.5	MAY 30 . . .	6.5		

MONROE COUNTY, 07S06E15ADBB1 (LAT 41°52'35", LONG 83°41'40") DEPTH 17 ft (5 m)					
OCT 03, 1977	11.5	FEB 13 . . .	10.0	JUL 12 . . .	9.0
NOV 03 . . .	12.0	MAR 27 . . .	9.0	AUG 09 . . .	10.0
DEC 05 . . .	11.5	APR 25 . . .	8.5	SEP 13 . . .	10.5
JAN 09, 1978	11.0	JUN 05 . . .	8.5		

OAKLAND COUNTY, 05N08E08ACAC1 (LAT 42°51'16", LONG 83°32'15") DEPTH 42 ft (13 m)					
OCT 21, 1977	9.0	FEB 23 . . .	9.0	JUN 28 . . .	9.0
NOV 22 . . .	9.0	MAR 27 . . .	8.5	JUL 31 . . .	9.0
DEC 22 . . .	9.0	APR 25 . . .	8.5	AUG 29 . . .	9.0
JAN 24, 1978	9.0	MAY 23 . . .	9.0		

ONTONAGON COUNTY, 46N38W30ADDD1 (LAT 46°21'18", LONG 89°05'43") DEPTH 50 ft (15 m)					
MAR 14, 1978	7.0	JUN 13 . . .	7.0	AUG 22 . . .	7.0
MAY 08 . . .	7.0	JUL 25 . . .	6.5		

ROSCOMMON COUNTY, 24N02W20BABA1 (LAT 44°27'22", LONG 84°35'07") DEPTH 12 ft (4 m)					
OCT 19, 1977	10.0	FEB 16 . . .	5.5	JUL 19 . . .	8.0
NOV 21 . . .	9.0	APR 20 . . .	5.0	AUG 18 . . .	9.0
DEC 21 . . .	7.0	MAY 19 . . .	5.5	SEP 19 . . .	10.0
JAN 20, 1978	6.0	JUN 19 . . .	7.0		



# INDEX

	Page		Page
Accuracy of data.....	12	Black Creek (tributary to Kearsley Creek)	
Acknowledgment.....	2	near Davison.....	404
Acre-foot, definition of.....	2	Black Creek (tributary to Lake Michigan),	
Adenosine triphosphate, definition of.....	2	near Muskegon.....	400,402
Adrian, River Raisin at.....	389	near Muskegon Heights.....	408
Afton, Pigeon River (tributary to Indian		near Wolf Lake.....	408
River) at.....	245	Black River (tributary to Cheboygan River),	
Algae, definition of.....	2	near Cheboygan.....	403
Algal growth potential, definition of.....	2	near Tower.....	247
Alger County, ground-water levels.....	427	Black River (tributary to Lake Michigan)	
ground-water temperatures.....	442	near Bangor.....	166
Alicia, Flint River near.....	298	Black River (tributary to Lake Michigan)	
Allen, Hog Creek near.....	151	near Garnet.....	62-64
Hog Creek Tributary near.....	399	Black River (tributary to Lake Michigan)	
Alma, Pine River (tributary to Chippewa		near Zeeland.....	187
River) at.....	305	Black River (tributary to Lake Superior)	
Almont, North Branch Clinton River at.....	406	near Bessemer.....	24
Alpena County, ground-water levels.....	427	Black River (tributary to Middle Branch	
Alpha, Paint River near.....	123	Escanaba River) near Republic.....	401
Alston, Sturgeon River (tributary to Lake		Black River (tributary to St. Clair River)	
Superior) near.....	40	near Fargo.....	325
Analyses of samples collected at		Blaney, Manistique River near.....	401
miscellaneous sites.....	412-425	Blue-green algae, definition of.....	6
Andersonville, Huron River near.....	406	Boardman River near Mayfield.....	235
Ann Arbor, Huron River at.....	376	Bolton, Thunder Bay River near.....	256
Aquifer, definition of.....	2	North Branch, Thunder Bay River near.....	257
Armada, Coon Creek near.....	406	Bond Falls Canal near Paulding.....	27
East Branch Coon Creek at.....	340	Bond Falls Reservoir near Paulding.....	28
Highbank Creek near.....	406	Bottom material, definition of.....	4
Armstrong Creek near Montrose.....	405	Boyne City, Boyne River near.....	403,409
Artesian, definition of.....	2	Boyne River near Boyne City.....	403,409
Artificial substrate, definition of.....	7	Branch County, ground-water levels.....	428
Ash mass, definition of.....	4	Brent Run near Montrose.....	296,410
Athens, Nottawa Creek near.....	153	Bridgeton, Muskegon River near.....	214-219
Atlas, Kearsley Creek near.....	404	Brighton Lake Outlet at Brighton.....	411
Auburn Heights, Clinton River at.....	330	Brimley, East Branch Waika River near.....	401
Galloway Creek near.....	331	West Branch Waika River near.....	401
Au Gres River, East Branch, at McIvor.....	403	Brooks Creek at Newaygo.....	409
near National City.....	270	Brown Creek at East Jordan.....	409
Augusta, Augusta Creek near.....	170	Brule River near Florence, WI.....	121
Augusta Creek near Augusta.....	170	Buck Creek at Grandville.....	402
Au Sable, Au Sable River near.....	266-269	Burlington, St. Joseph River (tributary to	
Au Sable River, at Grayling.....	258-260	Lake Michigan) near.....	150
at Mio.....	265	Butternut Creek near Genesee.....	290
near Au Sable.....	266-269	Byron, Shiawassee River at.....	282-284
East Branch, at Grayling.....	261		
South Branch, near Luzerne.....	262-264	Caledonia, Thornapple River near.....	203
Avoca, Mill Creek (tributary to Black		Calhoun County, ground-water levels.....	429
River) near.....	405	Carp Creek at Ishpeming.....	401
Bacteria, definition of.....	2	Carp River near Negaunee.....	48
Bangor, Black River (tributary to Lake		Carrier Creek, near Grand Ledge.....	402
Michigan) near.....	166	near Lansing.....	196
Baraga County, ground-water levels.....	427	Carson City, Fish Creek at.....	399
Barry County, ground-water levels.....	428	Caseville, Pigeon River near.....	316-319
Battle Creek, at Battle Creek.....	168	Caspian, Iron River at.....	120
Battle Creek, Battle Creek at.....	168	Cass City, Cass River at.....	300
Kalamazoo River near.....	169	South Branch Cass River near.....	299
Bay County, ground-water levels.....	428	Cass County, ground-water levels.....	429
Bean Creek at Addison.....	411	Cass River, at Cass City.....	300
Bear Creek near Muskegon.....	220	at Frankenmuth.....	302
Beaverton, Tobacco River at.....	303	at Vassar.....	405
Bed material, definition of.....	4	at Wahjamega.....	301
Beebe Creek near Hillsdale.....	149	South Branch, near Cass City.....	299
Belle River, at Memphis.....	327	Cells/volume, definitions of.....	4
North Branch, at Imlay City.....	326	Central-Stadler Drain near Montrose.....	405
Benzonia, Betsie River near.....	400,403	CFS-day, definition of.....	4
Crystal Lake Outlet near.....	400	Champion, Peshekee River near.....	124-126
Bergland, West Branch Ontonagon River near..	32	Chassell, Sturgeon River near.....	41-44
Bessemer, Black River (tributary to Lake		Cheboygan, Black River (tributary to	
Michigan) near.....	24	Cheboygan River) near.....	403
Betsie River near Benzonia.....	400,403	Cheboygan River at.....	249-255
Big Beaver Creek near Warren.....	336	Cheboygan River near.....	246
Biochemical oxygen demand, definition of....	4	Cheboygan County, ground-water levels.....	430
Biomass, definition of.....	4	Cheboygan River, at Cheboygan.....	249-255
Birmingham, River Rouge at.....	355	near Cheboygan.....	246
Bixby Creek near Rose City.....	403	Chelsea, North Fork Mill Creek near.....	368-369
		Chemical oxygen demand, definition of.....	4

	Page		Page
Cherry Creek near Harvey.....	399	Downstream order and station number.....	8
Chippmunk Creek near Genesee.....	404	Drainage area, definition of.....	5
Chippewa County, ground-water levels.....	430	Drainage basin, definition of.....	5
Chippewa River, near Midland.....	405	Drayton Plains, Clinton River near.....	329
near Mount Pleasant.....	304	Sashabaw Creek near.....	328
Chlorophyll, definition of.....	4	Dry mass, definition of.....	4
Cisco Branch Ontonagon River at Cisco		Duffield, Jones Creek at.....	404
Lake Outlet.....	33		
Clam River at Vogel Center.....	206	Eagle Lake near Decatur.....	423-424
Clarendon, St. Joseph River (tributary to		Eagle, looking Glass River near.....	198
Lake Michigan) at.....	402	East Jordan, Jordan River near.....	236-238
Clinton County, ground-water levels.....	430	East Lansing, Red Cedar River at.....	193
ground-water temperatures.....	442	East Pond Creek at Romeo.....	339
Clinton River, at Auburn Heights.....	330	Eaton County, ground-water levels.....	432
at Mount Clemens.....	343-350	Eaton Rapids, Grand River near.....	189
Middle Branch, at Macomb.....	342	Elkhart, IN, St. Joseph River (tributary to	
near Macomb.....	406	Lake Michigan) at.....	162
near Drayton Plains.....	329	Elkhart River, at Goshen, IN.....	161
near Fraser.....	338	North Branch near Cosperville, IN.....	160
North Branch, at Almont.....	406	Elo, Otter River near.....	401
near Meade.....	406	Escanaba River, at Cornell.....	106-112
near Mount Clemens.....	341	East Branch, at Gwinn.....	104-105
near Romeo.....	406	Middle Branch, at Humboldt.....	73-75
Clio, Silver Creek near.....	405	near Greenwood.....	86-88
Coldwater Lake near Coldwater.....	417-418	near Ishpeming.....	89-90
Coldwater River near Hodunk.....	152	near Princeton.....	91-92
Cole Creek near Flushing.....	405	Evans Ditch at Southfield.....	357
Color unit, definition of.....	4	Evart, Muskegon River at.....	207-209
Commerce, Huron River at.....	406	Ewen, South Branch Ontonagon River at.....	401
Comstock Creek near Comstock.....	408	Explanation, of ground-water level records..	13
Comstock, Kalamazoo River at.....	171	of stage and water-discharge records.....	10-12
Contents, definition of.....	4	of water-quality records.....	12-13
Control, definition of.....	4		
Control structure, definition of.....	4	Factors for converting English Units to Inter-	
Coon Creek, near Armada.....	406	national System (SI) Units....Inside back cover	
East Branch, at Armada.....	340	Fargo, Black River (tributary to St. Clair	
near New Haven.....	406	River) near.....	325
Cooperation.....	1	Farmers Creek near Lapeer.....	287
Cora Lake near Lawrence.....	425	Farmington, Upper River Rouge at.....	358
Cornell, Escanaba River at.....	106-112	Fawn River near White Pigeon.....	402
Cosperville, IN, North Branch Elkhart		Fecal coliform bacteria, definition of.....	2
River near.....	160	Fecal streptococcal bacteria, definition of.....	4
Crawford County, ground-water levels.....	431	Felch, East Branch Sturgeon River near.....	134
Crest-stage partial-record stations.....	401-407	Fennville, Kalamazoo River near.....	178
Crooked Lake at Sister Lakes.....	419-420	Fergus, Shiawassee River near.....	286
Crystal Falls, Michigamme River near.....	131	Fish Creek at Carson City.....	399
Paint River at.....	122	Flat River at Smyrna.....	201
Crystal Lake Outlet near Benzonia.....	400	Flint, Flint River near.....	295
Cubic feet per second per square mile,		Gilkey Creek near.....	292
definition of.....	4	Swartz Creek at.....	293
Cubic foot per second, definition of.....	4	Thread Creek near.....	294
		Flint River, at Flint.....	410
Dansville, Deer Creek (tributary to Red		near Alicia.....	298
Cedar River) near.....	191	near Flint.....	295
Davis Creek near South Lyon.....	411	near Fosters.....	297
Davison, Black Creek (tributary to Kearsley		near Montrose.....	410
Creek) near.....	404	near Otisville.....	289
Kearsley Creek near.....	291	South Branch, near Lapeer.....	400
Deer Creek (tributary to Red Cedar River)		near Millville.....	400,404
near Dansville.....	191	Florence, WI, Brule River near.....	121
Deer Creek (tributary to North Branch		Menominee River near.....	132
Clinton River) near Meade.....	406	Flowerfield Creek at Flowerfield.....	402
Definition of terms.....	2-8	Flowerfield, Flowerfield Creek at.....	402
Delhi Mills, Huron River at.....	373-375	Flushing, Cole Creek near.....	405
Delta County, ground-water levels.....	431	Mistiguay Creek near.....	405
Detroit, Detroit River at.....	351-354	Ford Lake (Huron River) near Rawsonville.....	380-381
River Rouge at.....	359	Ford River near Hyde.....	113-119
Detroit River at Detroit.....	351-354	Foster City, Sturgeon River (tributary to	
Detroit River, streams tributary to, crest-		Menominee River) near.....	138-140
stage partial-record stations.....	406	Fosters, Flint River near.....	297
gaging-station records.....	351-360	Frank and Poet Drain at Trenton.....	406
Dexter, Huron River near.....	364-365, 407	Frankenmuth, Cass River at.....	302
Mill Creek (tributary to Huron River)		Fraser, Clinton River near.....	338
near.....	372	Freeman Drain near Montrose.....	405
Diatoms, definition of.....	6	Freesoil, Little Manistee River near.....	400,403
Dickinson County, ground-water levels.....	431	Fulton, Little Portage Creek near.....	402
ground-water temperatures.....	442		
Discharge at, partial-record stations		Gage height, definition of.....	5
and miscellaneous sites.....	399-411	Gaging station, definition of.....	5
Crest-stage partial-record stations.....	401-407	records.....	20-398
Low-flow partial-record stations.....	399-400	Gaines, Jones Creek near.....	404
Miscellaneous sites.....	408-411	Porter Drain near.....	404
Discharge, definition of.....	4	Galien River near Union Pier.....	402
Dissolved, definition of.....	4	Galloway Creek near Auburn Heights.....	331
Diversity index, definition of.....	5	Gamble Creek at Lupton.....	403
Dober Mine Pond Outlet.....	408	Garden City, Middle River Rouge near.....	406
Dowagiac River at Sumnerville.....	164		

	Page		Page
Garnet, Black River (tributary to Lake Michigan) near.....	62-64	Hyde, Ford River near.....	113-119
Genesee, Butternut Creek near.....	290	Hydrologic bench-mark station, definition of.....	9
Chipmunk Creek near.....	404	Hydrologic conditions.....	2
Powers-Cullen Drain near.....	404	graph of.....	3
Genesee County, ground-water levels.....	432	Hydrologic unit, definition of.....	5
Germfask, Manistique River at.....	401		
Gilkey Creek near Flint.....	292	Imlay City, North Branch Belle River at.....	326
Gloede Ditch near Waldenburg.....	406	Indian Creek near Clifford.....	410
Gogebic County, ground-water levels.....	432	Indian Lake near Manistique.....	412-416
Goodison, Stony Creek (tributary to Clinton River) near.....	400	Indian River, Indian River (tributary to Cheboygan River) at.....	243
Goodrich, Thread Creek near.....	405	Indian River (tributary to Cheboygan River) at Indian River.....	243
Goose Lake Outlet near Sands Station.....	101-103	Indian River (tributary to Manistique River) near Manistique.....	401
Goshen, IN, Elkhart River at.....	161	Ingham County, ground-water levels.....	433
Grand Blanc, Swartz Creek near.....	404	ground-water temperatures.....	442
Grand Ledge, Carrier Creek near.....	402	Inkster, Lower River Rouge at.....	360
Grand Rapids, Grand River at.....	205	Instantaneous discharge, definition of.....	4
Plaster Creek at.....	402	Introduction.....	1
Grand River, at Grand Rapids.....	205	Ionia, Grand River at.....	200
at Ionia.....	200	Iron County, ground-water levels.....	434
at Jackson.....	188	Iron Mountain, Pine Creek near.....	141-143
at Lansing.....	195	Iron River at Caspian.....	120
at Portland.....	197	Iron River near Iron River.....	408
near Eaton Rapids.....	189	Ishpeming, Carp Creek at.....	401
near Vandercook.....	408	Middle Branch Escanaba River near.....	89-90
Grand Traverse County, ground-water levels.....	433		
Grandville, Buck Creek at.....	402	Jackson County, ground-water levels.....	434
Grayling, Au Sable River at.....	258-260	Jackson, Grand River at.....	188
East Branch Au Sable River at.....	261	Jeddo, Silver Creek near.....	324
Manistee River near.....	403	Jones Creek, at Duffield.....	404
Green algae, definition of.....	6	near Gaines.....	404
Green Creek, near Palmer.....	93, 399	Jordan River, near Alba.....	409
near Princeton.....	94-96	near East Jordan.....	236-238, 409
Greenwood Afterbay near Greenwood.....	78-79		
Greenwood Diversion near Greenwood.....	80-82	Kalamazoo County, ground-water levels.....	434, 435
Greenwood, Greenwood Afterbay near.....	78-79	Kalamazoo, Portage Creek (tributary to Kalamazoo River) at.....	175-177
Greenwood Diversion near.....	80-82	Portage Creek (tributary to Kalamazoo River) near.....	172
Greenwood Release (Middle Branch Escanaba River) near.....	83-85	West Fork Portage Creek at.....	174
Greenwood Reservoir near.....	77	Kalamazoo River, at Comstock.....	171
Middle Branch Escanaba River near.....	86-88	at Marshall.....	167
Greenwood Release (Middle Branch Escanaba River) near Greenwood.....	83-85	at Saugatuck.....	180-186
Greenwood Reservoir near Greenwood.....	77	near Battle Creek.....	169
Ground-water level records by county.....	427-441	near Fennville.....	178
Ground-water, temperature of.....	442-443	Kawkawlin, North Branch Kawkawlin River near Kawkawlin River, North Branch, near Kawkawlin.....	280
Gwinn, East Branch Escanaba River at.....	104-105	Kearsley Creek, near Atlas.....	404
		near Davison.....	291
Hamburg, Huron River near.....	363	Kent County, ground-water levels.....	435
Hardness, definition of.....	5	Kimball Drain near Swartz Creek.....	404
Hardwood, East Branch Sturgeon River at.....	135-137	Klacking Creek near Selkirk.....	404
Hart, Pentwater River near.....	402	Koss, Menominee River below.....	145
Harvey, Cherry Creek near.....	399		
Hastings, Thornapple River near.....	202	Lake Erie, streams tributary to, crest-stage partial-record stations.....	406-407
Highbank Creek near Armada.....	406	gaging-station records.....	361-398
Hillman, Thunder Bay River near.....	403	measurements at miscellaneous sites.....	410-411
Hillsdale, Beebe Creek near.....	149	Lake Huron, streams tributary to, crest-stage partial-record stations.....	403-405
Hillsdale County, ground-water levels.....	433	gaging-station records.....	239-319
ground-water temperatures.....	442	low-flow partial-record stations.....	400
Hodunk, Coldwater River (tributary to St. Joseph River) near.....	152	measurements at miscellaneous sites.....	409-410
Hog Creek, near Allen.....	151	Lake Linden, Trap Rock River near.....	45-47
Tributary near Allen.....	399	Lake Michigan, streams tributary to, analysis of samples collected at miscellaneous sites.....	412-425
Holloway Reservoir near Otisville.....	288	crest-stage partial-record stations.....	401-403
Holly, Swartz Creek near.....	404	gaging-station records.....	62-238
Holt, Sycamore Creek near.....	194	low-flow partial-record stations.....	399-400
Hopkins, Rabbit River near.....	179	measurements at miscellaneous sites.....	408-409
Horseshoe Lake Outlet near Hamburg.....	411	Lake Orion, Paint Creek near.....	405
Horton Creek near Horton Bay.....	409	Lake St. Clair, streams tributary to, crest-stage partial-record stations.....	405-406
Houghton Creek, at Rose City.....	403	gaging-station records.....	320-323, 328-350
near Lupton.....	403	low-flow partial-record stations.....	400
Hoxeyville, Pine River (tributary to Manistee River) near.....	226	Lake Superior, streams tributary to, crest-stage partial-record stations.....	401
Humboldt, Middle Branch Escanaba River at.....	73-75	gaging-station records.....	20-56
Huron River, at Ann Arbor.....	376	low-flow partial-record stations.....	399
at Commerce.....	406	measurements at miscellaneous sites.....	408
at Delhi Mills.....	373-375	Lakes and Reservoirs:	
at Milford.....	361	Bond Falls Reservoir near Paulding.....	28
at Ypsilanti.....	377-379	Coldwater Lake near Coldwater.....	417-418
near Andersonville.....	406	Cora Lake near Lawrence.....	425
near Dexter.....	364-365, 407		
near Hamburg.....	363		
near New Hudson.....	362		
near Oxbow.....	410		
near Oxbow Lake.....	410		
near Pontiac Lake.....	410		
near Wixom.....	410		



	Page		Page
Lakes and Reservoirs (Continued):		Merriman, Mounty's Creek near.....	399
Crooked Lake at Sister Lakes.....	419-420	Steel Creek near.....	399
Eagle Lake near Decatur.....	423-424	Merritt, Muskegon River near.....	402
Ford Lake near Rawsonville.....	380-381	Metamorphic stage, definition of.....	5
Greenwood Reservoir near Greenwood.....	77	Methylene blue active substance, definition of.....	5
Holloway Reservoir near Otisville.....	288	Michigamme, Michigamme River near.....	127-128
Indian Lake near Manistiquie.....	412-416	Michigamme River, at Republic.....	402
Round Lake near Sister Lakes.....	421-422	near Crystal Falls.....	131
Schweitzer Reservoir near Palmer.....	97	near Michigamme.....	127-128
Stony Lake near Washington.....	334	near Witch Lake.....	129-130
Lansing, Carrier Creek near.....	196	Micrograms per gram, definition of.....	5
Grand River at.....	195	Micrograms per liter, definition of.....	5
Lapeer, Farmers Creek near.....	287	Middle River Rouge near Garden City.....	406
South Branch Flint River near.....	400	Midland, Chippewa River near.....	405
Lefler-Scothan Drain near Otisville.....	404	Pine River near.....	306
Lenawee County, ground-water levels.....	436	Tittabawassee River at.....	307
ground-water temperatures.....	442	Milan, Saline River above.....	392-393
Lima Center, Mill Creek (tributary to Huron River) near.....	366-367, 407	Milford, Huron River at.....	361
North Fork Mill Creek near.....	370-371	Mill Creek (tributary to Black River) near Avoca.....	405
Lime Lake Outlet at Panama, IN.....	157	Mill Creek (tributary to Huron River), near Dexter.....	372
Linden, Shiawassee River at.....	281	near Lima Center.....	366-367
List of gaging-stations, in downstream order, for which records are published.....	VI-IX	North Fork, near Chelsea.....	368-369
List of counties for which water-level records are published.....	X	near Lima Center.....	370-371, 407
Litchfield, Sand Creek at.....	402	Mill Creek (tributary to Paw Paw River) near Watervliet.....	408
Little Bear Creek at Barry Junction.....	409	Milligrams per liter, definition of.....	5
Little Manistee River near Freesoil.....	400, 403	Millville, South Branch Flint River near.....	400, 404
Little Muskegon River near Morley.....	210-212	Minges Creek near Battle Creek.....	408
Little Portage Creek near Fulton.....	402	Mio, Au Sable River at.....	265
Livingston County, ground-water levels.....	436	Miscellaneous sites, discharge measurements at.....	408-411
Looking Glass River near Eagle.....	198	Misteguay Creek near Flushing.....	405
Lower River Rouge at Inkster.....	360	Monroe County, ground-water levels.....	437
Low-flow partial-record stations.....	399-400	ground-water temperatures.....	443
Lupton, Gamble Creek at.....	403	Monroe Creek near East Jordan.....	409
Houghton Creek near.....	403	Monroe, River Raisin near.....	394-398
Rifle River at "The Ranch" near.....	404	Montrose, Armstrong Creek near.....	405
Luzerne, South Branch Au Sable River near....	262-264	Brent Run near.....	296
Mackinac County, ground-water levels.....	436	Central-Stadler Drain near.....	405
Macomb, McBride Drain near.....	406	Freeman Drain near.....	405
Middle Branch Clinton River at.....	342	Pine Run near.....	405
Middle Branch Clinton River near.....	406	Morley, Little Muskegon River near.....	210-212
Manchester, River Raisin at.....	386-387	Mottville, St. Joseph River (tributary to Lake Michigan) at.....	158
River Raisin near.....	385	Mount Clemens, Clinton River at.....	343-350
Manistee, Manistee River at.....	228-234	North Branch near.....	341
Manistee River near.....	227	Mount Pleasant, Chippewa River near.....	304
Manistee River, at Manistee.....	228-234	Mounty's Creek near Merriman.....	399
near Grayling.....	403	Muskegon, Bear Creek near.....	220
near Manistee.....	227	Black Creek (tributary to Lake Michigan) near.....	400, 402
near Sherman.....	225	Muskegon County, ground-water levels.....	438
Manistique, Indian River (tributary to Manistique River) near.....	401	Muskegon River, at Evart.....	207-209
Manistique River above.....	66-71	at Newaygo.....	213
Manistique River near.....	65	at Bridgeton.....	409
Manistique River, above Manistique.....	66-71	near Bridgeton.....	214-219
at Germfask.....	401	near Merritt.....	402
near Blaney.....	401	Nahma Junction, Sturgeon River (tributary to Lake Michigan) near.....	72
near Manistique.....	65	Nashville, Quaker Brook near.....	402
Maple Rapids, Maple River at.....	199	National City, Au Gres River near.....	270
Maple River at Maple Rapids.....	199	National Geodetic Vertical Datum of 1929, definition of.....	5
Map of Michigan, water-discharge stations....	16-17	National stream-quality accounting network (NASQAN), definition of.....	9
water-quality stations.....	18-19	Natural substrates, definition of.....	7
ground-water observation wells.....	426	Negaunee, Carp River near.....	48
Marenisco, Presque Isle River at.....	25	Newaygo, Muskegon River at.....	213
Marshall, Kalamazoo River at.....	167	New Haven, East Branch Coon Creek near.....	406
Marquette County, ground-water levels.....	437	New Hudson, Huron River near.....	362
ground-water temperatures.....	442	Niles, St. Joseph River (tributary to Lake Michigan) at.....	163
Mason, Sycamore Creek near.....	402	North Bradley, Salt River near.....	405
Mass, East Branch Ontonagon River near.....	30	Norton Creek near Wixom.....	411
Mayfield, Boardman River near.....	235	Nottawa Creek near Athens.....	153
McBride Drain near Macomb.....	406	Nottawa, Prairie River near.....	156
McAllister, Menominee River near.....	146-148	Numbering system for wells.....	8
McIvor, East Branch Au Gres at.....	403	Oakland County, ground-water levels.....	438
Meade, Deer Creek (tributary to North Branch Clinton River) near.....	406	ground-water temperatures.....	443
North Branch Clinton River near.....	406	Oakville, Stony Creek (tributary to Lake Erie) at.....	382
Mean concentration, definition of.....	7	Oceana County, ground-water levels.....	438
Mean discharge, definition of.....	4	Ocqueoc, Rainy River near.....	248
Measurements at miscellaneous sites.....	408-411		
Memphis, Belle River at.....	327		
Menominee County, ground-water levels.....	437		
ground-water temperatures.....	443		
Menominee River, below Koss.....	145		
near Florence, WI.....	132		
near McAllister.....	146-148		
near Pembine, WI.....	144		

	Page		Page
Ogemaw County, ground-water levels.....	439	Plaster Creek, at Grand Rapids.....	402
Ontonagon County, ground-water levels.....	439	at Wyoming.....	400
ground-water temperatures.....	443	Plum Brook at Utica.....	337
Ontonagon River, Cisco Branch, at Cisco		Plymouth Mine Pond Outlet at Ramsay.....	408
Lake Outlet.....	33	Polychlorinated biphenyls, definition of....	6
East Branch, near Mass.....	30	Port Huron, St. Clair River at.....	320-323
Middle Branch, near Paulding.....	26	Portage Creek (tributary to Kalamazoo River),	
near Rockland.....	31	at Kalamazoo.....	175-177
near Trout Creek.....	29	near Kalamazoo.....	172
near Rockland.....	34-38	West Fork, at Kalamazoo.....	174
South Branch, at Ewen.....	401	near Oshtemo.....	173
West Branch, near Bergland.....	32	Portage Creek (tributary to St. Joseph	
Ore Lake Outlet near Hamburg.....	411	River) near Vicksburg.....	154
Organic mass, definition of.....	4	Portage Lake Outlet near Dover.....	411
Organism, count/area, definition of.....	5	Portage River (tributary to Grand River)	
count/volume, definition of.....	5	near Jackson.....	408
Oshtemo, West Fork Portage Creek near.....	173	Portage River (tributary to Huron River)	
Other data available, stage and water-		near Pinckney.....	407
discharge records.....	12	Portage River (tributary to St. Joseph	
Otisville, Flint River near.....	289	River) near Vicksburg.....	154
Holloway Reservoir near.....	288	Porter Creek at Advance.....	409
Lefler-Scothan Drain near.....	404	Porter Drain near Gaines.....	404
Otter River near Elo.....	401	Portland, Grand River at.....	197
Owendale, Pigeon River (tributary to Lake		Powers-Cullen Drain near Genesee.....	404
Huron) near.....	315	Prairie River near Nottawa.....	156
Owosso, Shiawassee River at.....	285	Presque Isle County, ground-water levels....	439
		Presque Isle River, at Marenisco.....	25
Paint Creek (tributary to Clinton River),		near Tula.....	401
at Rochester.....	332	Primary productivity, definition of.....	6
near Lake Orion.....	405	Princeton, Green Creek near.....	94-96
Paint River, at Crystal Falls.....	122	Middle Branch Escanaba River near	91-92
near Alpha.....	123	Prior Creek near Selkirk.....	404
Palmer, Green Creek near.....	93,399	Publications on techniques of water-	
Schweitzer Creek near.....	98	resources investigations.....	14
Schweitzer Reservoir near.....	97		
Warner Creek near.....	100	Quaker Brook near Nashville.....	402
Warner Creek Tributary near.....	99,399		
Panama, IN, Lime Lake Outlet at.....	157	Rabbit River near Hopkins.....	179
Paradise, Two Hearted River near.....	401	Radio chemical program, definition of.....	9
Partial-record station, definition of.....	5	Rainy River near Ocqueoc.....	248
Partical-size classification, definition of..	5	Randville, West Branch Sturgeon River near..	133
Partical-size, definition of.....	5	Rapid River, Whitefish River near.....	399
Paulding, Bond Falls Canal near.....	27	Rattle Run, Pine River (tributary to	
Bond Falls Reservoir near.....	28	St. Clair River) near.....	400,405
Middle Branch Ontonagon River near.....	26	Rawsonville, Ford Lake (Huron River) near...	380-381
Paw Paw River, at Riverside.....	165	Ray Center, Tupper Brook at.....	406
at Watervliet.....	408	Red Cedar River, at East Lansing.....	193
Pembae, WI, Menominee River near.....	144	near Williamston.....	190
Pentwater, North Branch Pentwater River near.	403	Republic, Black River (tributary to Middle	
Pentwater River, near Hart.....	402	Branch Escanaba River), near.....	401
North Branch, near Pentwater.....	403	Michigamme River at.....	402
Percent composition, definition of.....	6	Reservoir (see lakes and reservoirs)	
Perch River near Sidnaw.....	401	Rifle River, at Selkirk.....	271
Pere Marquette River at Scottville.....	222-224	at "The Ranch", near Lupton.....	404
Periphyton, definition of.....	6	near Sterling.....	273-279
Perronville, Tenmile Creek at.....	401	River Raisin, at Manchester.....	386-387
Peshekee River near Champion.....	124-126	near Adrian.....	389
Pesticide program, definition of.....	9	near Manchester.....	385
Pesticides, definition of.....	6	near Monroe.....	394-398
Pettibone Creek at Milford.....	411	near Sharonville.....	383-384
Phytoplankton, definition of.....	6	near Tecumseh.....	388
Picocurie, definition of.....	6	River Rouge, at Birmingham.....	355
Pigeon River (tributary to Indian River),		at Detroit.....	359
at Afton.....	245	at Southfield.....	356
near Vanderbilt.....	244	Riverside, Paw Paw River at.....	165
Pigeon River (tributary to Lake Huron),		Rochester, Paint Creek (tributary to	
near Caseville.....	316-319	Clinton River) at.....	332
near Owendale.....	315	Rockford, Rogue River near.....	204
Pigeon River (tributary to St. Joseph River)		Rockland, Middle Branch Ontonagon River near	31
near Scott, IN.....	159	Ontonagon River near.....	34-38
Pinckney, Portage River (tributary to Huron		Rogue River near Rockford.....	204
River) near.....	407	Romeo, East Pond Creek at.....	339
Pine Creek (tributary to Sturgeon River)		North Branch Clinton River near.....	406
near Iron Mountain.....	141-143	Stony Creek (tributary to Clinton River)	
Pine River (tributary to Chippewa River),		near.....	333
at Alma.....	305	Roscommon County, ground-water levels.....	440
near Midland.....	306	ground-water temperatures.....	443
Pine River (tributary to Lake Huron)		Rose City, Bixby Creek near.....	403
near Rudyard.....	239	Houghton Creek at.....	403
Pine River (tributary to Manistee River),		Wilkins Creek near.....	403
East Branch, near Tustin.....	403	Round Lake at Sister Lakes.....	421-422
near Hoxeyville.....	226	Round Lake Outlet near Trenary.....	399
Pine River (tributary to St. Clair River)		Rudyard, Pine River (tributary to Lake	
near Rattle Run.....	400,405	Huron) near.....	239
Pine Run, near Birch Run.....	410	Runoff in inches, definition of.....	6
near Montrose.....	405		
Pinnebog River near Pinnebog.....	410	Saginaw River at Saginaw.....	308-314
Plankton, definition of.....	6	Saginaw, Saginaw River at.....	308-314

	Page		Page
St. Clair River at Port Huron.....	320-323	Sturgeon River (tributary to Menominee River), near Foster City.....	138-140
St. Clair River, streams tributary to, crest-stage partial-record stations....	405	East Branch, at Hardwood.....	135-137
gaging-station records.....	324-327	near Felch.....	134
low-flow partial-record stations.....	400	West Branch, near Randville.....	133
St. Joseph Creek near Hudson.....	411	Substrate, definition of.....	7
St. Joseph River (tributary to Lake Michigan), at Clarendon.....	402	Summerville, Dowagiac River at.....	164
at Elkhart, IN.....	162	Sunset Creek near Iron River.....	408
at Mottville.....	158	Surface area, definition of.....	7
at Niles.....	163	Surficial bed material, definition of.....	7
at Three Rivers.....	155	Suspended, definition of.....	7
near Burlington.....	150	Suspended sediment, definition of.....	7
St. Marys River above Sault Ste. Marie.....	57-61	Suspended-sediment concentration, definition of.....	7
Saline River, above Milan.....	392-393	Suspended-sediment discharge, definition of.....	7
above Saline.....	390-391	Suspended-sediment load, definition of.....	7
near Saline.....	407	Swartz Creek, at Flint.....	293
Saline, Saline River above.....	390-391	near Grand Blanc.....	404
Saline River near.....	407	near Holly.....	404
Salt River near North Bradley.....	405	near Swartz Creek.....	404
Sand Creek at Litchfield.....	402	West Branch, near Swartz Creek.....	405
Sands Station, Goose Lake Outlet near.....	101-103	Swartz Creek, Kimball Drain near.....	404
Sanilac County, ground-water levels.....	440	Swartz Creek near.....	404
Sashabaw Creek near Drayton Plains.....	328	West Branch Swartz Creek near.....	405
Saugatuck, Kalamazoo River at.....	180-186	Sycamore Creek, near Holt.....	194
Sault Ste. Marie, St. Marys River above.....	57-61	near Mason.....	402
Schoolcraft County, ground-water levels.....	440		
Schweitzer Creek near Palmer.....	98	Tahquamenon Paradise, Tahquamenon River near.....	49-56
Schweitzer Reservoir near Palmer.....	97	Tahquamenon River near Tahquamenon Paradise.....	49-56
Scott, IN, Pigeon River (tributary to St. Joseph River) near.....	159	Taxonomy, definition of.....	7
Scottville, Pere Marquette River at.....	222-224	Tecumseh, River Raisin near.....	388
Sediment, definition of.....	6	Temperatures of ground water.....	442-443
explanation of.....	13	Tennile Creek at Perronville.....	401
Selkirk, Klacking Creek near.....	404	Thornapple River, near Caledonia.....	203
Prior Creek near.....	404	near Hastings.....	202
Rifle River at.....	271	Thread Creek, near Flint.....	294
Shepards Creek near.....	404	near Goodrich.....	405
South Branch Shepards Creek near.....	272	Three Rivers, St. Joseph River (tributary to Lake Michigan) at.....	155
Sharonville, River Raisin near.....	383-384	Thunder Bay River, near Bolton.....	256
Shepards Creek, near Selkirk.....	404	near Hillman.....	403
South Branch, near Selkirk.....	272	North Branch, near Bolton.....	257
Sherman, Manistee River near.....	225	Time-weighted average, definition of.....	7
Shiawassee River, at Byron.....	282-284	Tittabawassee River at Midland.....	307
at Linden.....	281	Tobacco River at Beaverton.....	303
at Owosso.....	285	Tons per acre-foot, definition of.....	8
near Argentine.....	410	Tons per day, definition of.....	8
near Fergus.....	286	Total coliform bacteria, definition of.....	2
Sidnaw, Perch River near.....	401	Total load, definition of.....	8
Sturgeon River (tributary to Lake Superior) near.....	39	Total organism count, definition of.....	5
Silver Creek (tributary to Flint River), near Birch Run.....	410	Total sediment discharge, definition of.....	7
near Clio.....	405	Tower, Black River (tributary to Cheboygan River) near.....	247
Silver Creek (tributary to Black River) near Jeddo.....	324	Trap Rock River near Lake Linden.....	45-47
Skunk Creek near Felch.....	408	Trenary, Round Lake Outlet near.....	399
Sloan Creek near Williamston.....	192	Trenton, Frank and Poet Drain at.....	406
Smyrna, Flat River at.....	201	Tritium network, definition of.....	9
Solute, definition of.....	7	Trout Creek, Middle Branch Ontonagon River near.....	29
Southfield, Evans Ditch at.....	357	Tula, Presque Isle River near.....	401
River Rouge at.....	356	Tupper Brook at Ray Center.....	406
South Ore Creek near Brighton.....	411	Tupper Creek near Lake Odessa.....	408
Special networks and programs.....	9	Tustin, East Branch Pine River near.....	403
Specific conductance, definition of.....	7	Two Hearted River near Paradise.....	401
Stage-discharge relation, definition of.....	7		
Stanley Creek near Iron River.....	408	Union Pier, Galien River near.....	402
Station numbers, explanation of.....	8	Upper River Rouge at Farmington.....	359
Steel Creek near Merriman.....	399	Utica, Plum Brook at.....	337
Sterling, Rifle River near.....	273-279		
Stony Creek (tributary to Clinton River), near Goodison.....	400	Van Buren County, ground-water levels.....	441
near Romeo.....	333	Vanderbilt, Pigeon River (tributary to Indian River) near.....	244
near Washington.....	335	Van Etten Creek near Oscoda.....	409
West Branch, near Washington.....	406	Vassar, Cass River at.....	405
Stony Creek (tributary to Lake Erie) at Oakville.....	382	Vicksburg, Portage River (tributary to St. Joseph River) near.....	154
Stony Lake near Washington.....	334	Vogel Center, Clam River at.....	206
Streamflow, definition of.....	7		
Strover Creek near Charlevoix.....	409	Wahjamega, Cass River at.....	301
Sturgeon River (tributary to Burt Lake) near Wolverine.....	240-242	Waiska River, East Branch, near Brimley.....	401
Sturgeon River (tributary to Lake Michigan) near Nahma Junction.....	72	West Branch, near Brimley.....	401
Sturgeon River (tributary to Lake Superior), near Alston.....	40	Waldenburg, Gloede Ditch near.....	406
near Chassell.....	41-44	Warner Creek, near Palmer.....	100
near Sidnaw.....	39	Tributary near Palmer.....	99,399
		Warren, Big Beaver Creek near.....	336

INDEX		451
	Page	Page
Washington Creek at Windigo.....	20-23	192
Washington, Stony Creek (tributary to Clinton River), near.....	335	20-23
Stony Lake near.....	334	129-130
West Branch Stony Creek near.....	406	240-242
Washtenaw County, ground-water levels.....	441	411
WDR, definition of.....	8	8
Weighted average, definition of.....	8	8
Wet mass, definition of.....	4	400
Wexford County, ground-water levels.....	441	
Whitefish River near Rapid River.....	399	
Whitehall, White River near.....	221	
White Pigeon, Fawn River near.....	402	
White River near Whitehall.....	221	
Wilkins Creek near Rose City.....	403	
Williamston, Red Cedar River near.....	190	
Williamston, Sloan Creek near.....		192
Windigo, Washington Creek at.....		20-23
Witch Lake, Michigamme River near.....		129-130
Wolverine, Sturgeon River (tributary to Burt Lake) near.....		240-242
Woodland Lake Outlet at Brighton.....		411
WRD, definition of.....		8
WSP, definition of.....		8
Wyoming, Plaster Creek at.....		400
Ypsilanti, Huron River at.....		377-379
Zeeland, Black River (tributary to Lake Michigan) near.....		187
Zooplankton, definition of.....		6





# FACTORS FOR CONVERTING INCH-POUND UNITS TO INTERNATIONAL SYSTEM UNITS (SI)

The following factors may be used to convert the inch-pound units published herein to the International System of Units (SI). This report contains both the inch-pound and SI unit equivalents in the station manuscript descriptions.

Multiply inch-pound units	By	To obtain SI units
<i>Length</i>		
inches (in)	$2.54 \times 10^1$	millimeters (mm)
	$2.54 \times 10^{-2}$	meters (m)
feet (ft)	$3.048 \times 10^{-1}$	meters (m)
miles (mi)	$1.609 \times 10^0$	kilometers (km)
<i>Area</i>		
acres	$4.047 \times 10^3$	square meters (m <sup>2</sup> )
	$4.047 \times 10^{-1}$	square hectometers (hm <sup>2</sup> )
	$4.047 \times 10^{-3}$	square kilometers (km <sup>2</sup> )
square miles (mi <sup>2</sup> )	$2.590 \times 10^0$	square kilometers (km <sup>2</sup> )
<i>Volume</i>		
gallons (gal)	$3.785 \times 10^0$	liters (L)
	$3.785 \times 10^0$	cubic decimeters (dm <sup>3</sup> )
	$3.785 \times 10^{-3}$	cubic meters (m <sup>3</sup> )
million gallons	$3.785 \times 10^3$	cubic meters (m <sup>3</sup> )
	$3.785 \times 10^{-3}$	cubic hectometers (hm <sup>3</sup> )
cubic feet (ft <sup>3</sup> )	$2.832 \times 10^1$	cubic decimeters (dm <sup>3</sup> )
	$2.832 \times 10^{-2}$	cubic meters (m <sup>3</sup> )
cfs-days	$2.447 \times 10^3$	cubic meters (m <sup>3</sup> )
	$2.447 \times 10^{-3}$	cubic hectometers (hm <sup>3</sup> )
acre-feet (acre-ft)	$1.233 \times 10^3$	cubic meters (m <sup>3</sup> )
	$1.233 \times 10^{-3}$	cubic hectometers (hm <sup>3</sup> )
	$1.233 \times 10^{-6}$	cubic kilometers (km <sup>3</sup> )
<i>Flow</i>		
cubic feet per second (ft <sup>3</sup> /s)	$2.832 \times 10^1$	liters per second (L/s)
	$2.832 \times 10^1$	cubic decimeters per second (dm <sup>3</sup> /s)
	$2.832 \times 10^{-2}$	cubic meters per second (m <sup>3</sup> /s)
gallons per minute (gal/min)	$6.309 \times 10^{-2}$	liters per second (L/s)
	$6.309 \times 10^{-2}$	cubic decimeters per second (dm <sup>3</sup> /s)
	$6.309 \times 10^{-5}$	cubic meters per second (m <sup>3</sup> /s)
million gallons per day	$4.381 \times 10^1$	cubic decimeters per second (dm <sup>3</sup> /s)
	$4.381 \times 10^{-2}$	cubic meters per second (m <sup>3</sup> /s)
<i>Mass</i>		
tons (short)	$9.072 \times 10^{-1}$	megagrams (Mg) or metric tons



POSTAGE AND FEES PAID  
U.S. DEPARTMENT OF THE INTERIOR  
INT 413



U.S. DEPARTMENT OF THE INTERIOR  
Geological Survey  
6520 Mercantile Way  
Lansing, MI 48910

OFFICIAL BUSINESS  
PENALTY FOR PRIVATE USE \$300  
SPECIAL 4TH CLASS BOOK RATE