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GEOLOGICAL SURVEY

HYDROLOGIC DATA FROM THE JOHNSON BROOK PHOSPHORUS LOADING STUDY, KENNEBEC COUNTY, MAINE, MARCH 1980 THROUGH SEPTEMBER 1981

By Thomas J. Maloney, David R. Dominie II, and
William J. Nichols, Jr.

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CONVERSION FACTORS

Multiply	by	To obtain
cubic foot per second per day $(ft^3/s)/d$	2447	cubic meter (m^3)
	0.002447	cubic hectometer (hm^3)
cubic foot per second per square mile $(ft^3/s)/mi^2$	10.93	liter per second per square kilometer $(L/s) / km^2$
	10.93	cubic decimeter per second per square kilometer $(dm^3/s)/km^2$
	0.01093	cubic meter per second per square kilometer $(m^3/s)/km^2$
cubic foot per second (ft^3/s)	28.32	liter per second (L/s)
	28.32	cubic decimeter per second (dm^3/s)
	0.02832	cubic meter per second (m^3/s)
inch (in)	25.4	millimeter (mm)
	2.54	centimeter (cm)
mile (mi)	1.609	kilometer (km)
square mile (mi^2)	2.590	square kilometer (km^2)

Temperature in degrees Fahrenheit (°F) can be converted to degrees Celsius (°C) as follows:

$$°F = 1.8°C + 32$$

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By Thomas J. Maloney[1], David R. Dominie II[2], and William J. Nichols, Jr.[1]

ABSTRACT

Streamflow, water-quality, and precipitation data collected during the 1980 and 1981 water years as part of the Johnson Brook phosphorus loading investigation are reported. Streamflow data include mean-daily discharges for the period May 12, 1980, through September 30, 1981, and instantaneous discharges determined during water-quality sampling. Water-quality data for the period March 1980 to September 1981 include total phosphorus concentrations determined from samples collected using cross-sectional depth-integrating sampling techniques and from samples collected using a pumping sampler. Suspended sediment concentrations, and water temperature and specific conductance values are also included. The precipitation data are daily totals for the period October 1980 through September 1981.

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INTRODUCTION

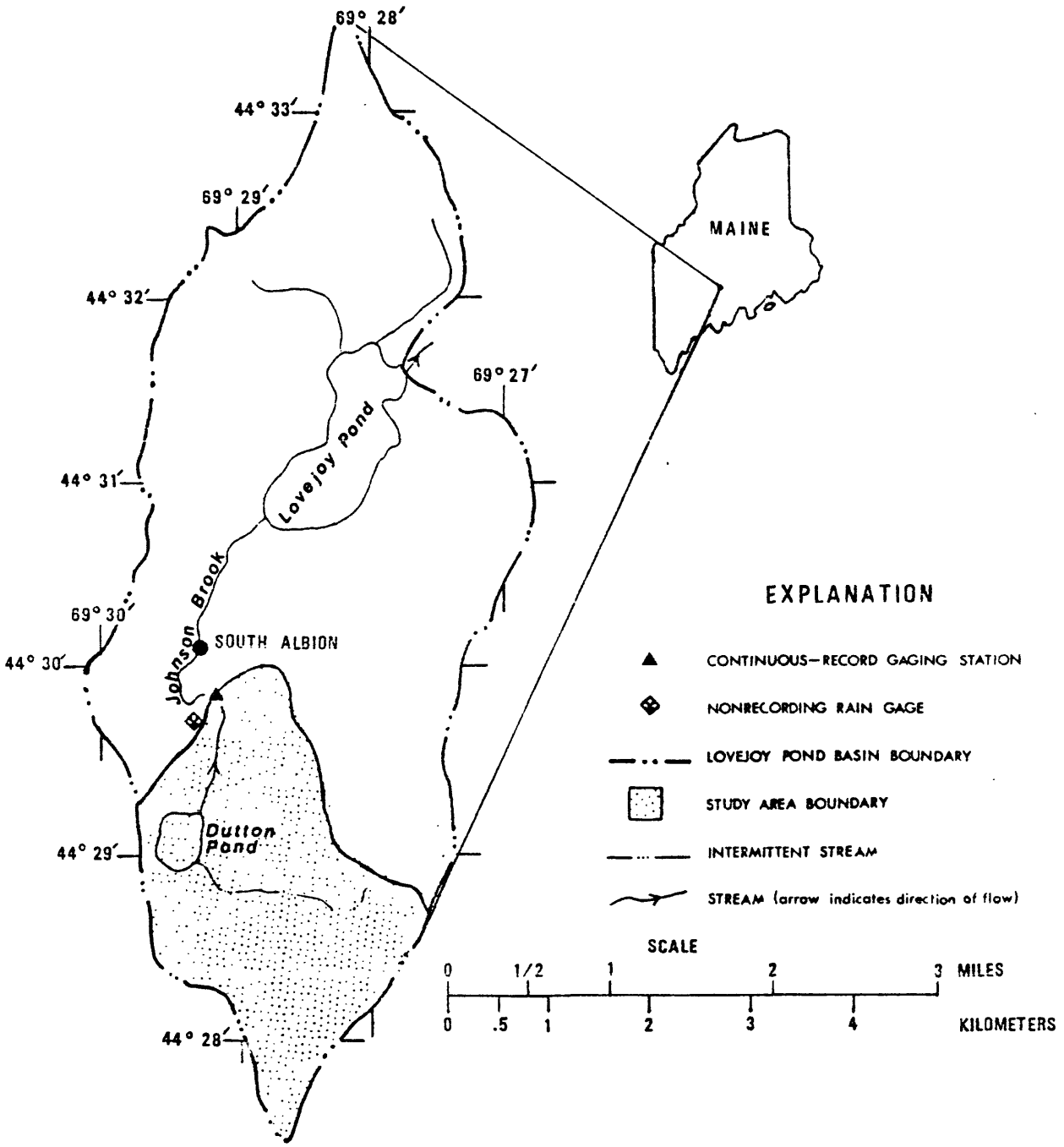
This report presents hydrologic data collected from March 1980 through September 1981 in the Johnson Brook watershed in South Albion, Kennebec County, Maine. The study is a cooperative effort by the U.S. Geological Survey and the Maine Department of Environmental Protection. The purpose of the study was to document changes in total phosphorus loads resulting from a change in agricultural waste management practices in the Johnson Brook watershed.

Description of the Study Area

The Johnson Brook watershed (fig. 1) is located in the Kennebec River drainage basin in south-central Maine. Johnson Brook originates in Dutton Pond and flows 2.3 mi to Lovejoy Pond. A stream-gaging station installed for the study is located about 0.5 miles southeast of South Albion and 0.8 miles downstream from Dutton Pond. The study area is that part of the Johnson Brook basin in which direct surface runoff from precipitation drains into the brook above the gaging station. The drainage area above the gaging station is 2.92 square miles.

Acknowledgments

Clayton and Dorothy Mason, local residents, have provided invaluable assistance in the collection of precipitation data.



BASE FROM U.S. GEOLOGICAL SURVEY 1:62,500 QUANDRANGLES: BURHNAM, 1957; WATERVILLE, 1957; VASSALBORO, 1958; LIBERTY, 1939.

Figure 1.--Map showing location of study area and data-collection sites in the headwaters of the Johnson Brook basin, South Albion, Maine.

DEFINITION OF TERMS

Definition of terms related to streamflow, water quality, ground water, and other hydrologic data used in this report, are defined as follows:

Cubic foot per second per day $(ft^3/s)/day$; cfs-day; total in table 1 is the volume of water represented by a flow of 1 cubic foot per second for 24 hours. It is equivalent to 86,400 cubic feet or 2,447 cubic meters.

Cubic foot per second (ft^3/s); is the rate of discharge representing a volume of 1 cubic foot passing a given point during 1 second and is equivalent to .02832 cubic meters per second.

Cubic foot per second per square mile $(ft^3/s)/mi^2$; (CFSM in table 1) 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.

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 in table 1) is the arithmetic mean of individual daily-mean discharges during a specific period.

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

Drainage basin is a part of the surface of the earth that is occupied by a drainage system, which consists of surface streams and bodies of impounded surface water.

Gage height is the water-surface elevation referred to some arbitrary gage datum. Gage height is often used interchangeably with the 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, lake, or resevoir where systematic observations of hydrologic data are obtained.

Milligrams per liter (mg/L in table 2) is a unit for expressing the concentration of chemical constituents in a sample. Milligrams per liter represents the mass of constituent per unit volume of sample.

Runoff in inches (IN in table 1) shows the depth to which the drainage area would be covered if all the runoff for a given time period were uniformly distributed.

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.

Specific conductance is a measure of the ability of a water to conduct an electrical current and is expressed in micromhos per centimeter at 25°C (umhos in table 2). Specific conductance is related to the type and concentration of ions in solution and can be used for estimating the dissolved-solids content of the water. Commonly, concentration of dissolved solids (in milligrams per liter) is about 65 percent of specific conductance (in micromhos per cm at 25°C). This relation is not constant from stream to stream and it may even vary in the same source with changes in composition of the water.

Streamflow is the discharge that occurs in a natural channel. Although the term "discharge" can be applied to flow of a canal, the word "streamflow" uniquely describes 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.

Total recoverable is the total amount of a given constituent in a representative water-suspended sediment sample, regardless of the constituent's physical or chemical form. The term is used only when analytical procedure assures measurement of at least 95 percent of the constituent present in both the dissolved and supended phases of the sample. Knowledge of the expected form of the constituent in the sample, as well as analytical methodology used, is required to judge when results should be reported as "total." (Note that the word "total" indicates the sample consists of a water-suspended sediment mixture and the analytical method determines all the constituent in the sample.)

COLLECTION AND ANALYSIS OF HYDROLOGIC DATA

Instrumentation used to collect hydrologic data for this study included a stream gage with a continuous stage recorder, a timer-controlled automatic pumping sampler, and a rain gage.

Streamflow data were collected in accordance with standard Survey procedures outlined in reports by Carter and Davidian (1968), Buchanan and Somers (1968, 1969), and Kennedy (in press). The streamflow data are presented in table 1.

Water-quality samples were collected using the instrumentation and equal-width-interval and equal-transit-rate (EWI-ETR) method described by Guy and Norman (1970). This method requires samples to be collected at several verticals of equal-width-intervals (EWI) in the cross section of the stream using an equal-transit-rate (ETR), both up and down in all verticals. Also, during storm runoff and snowmelt periods, an ISCO [1] automatic sampler was used to collect water-quality samples. The techniques used to operate the sampler are described in a manual provided by the manufacturer (Instrumentation Specialty Company, 1980).

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[1] The use of brand names in this report is for identification purposes only and does not imply endorsement by the U.S. Geological Survey.

The water-quality samples were analyzed for total phosphorus using the method described by Skougstad and others (1979). Also, many of the samples were analyzed for sediment concentration using the methods described by Guy (1969).

Field determinations of specific conductance and water temperature were made at the time EWI-ETR samples were collected.

The water-quality and instantaneous streamflow data at the time of sample collection are presented in table 2.

The rain gage used in this study is a standard National Weather Service model. The gage is checked once daily by an observer and the precipitation accumulation is recorded. The daily precipitation data for the gage are presented in table 3.

SELECTED REFERENCES

Buchanan, T. J., and Somers, W. P., 1968, Stage measurements at gaging stations: U.S. Geological Survey Techniques of Water-Resources Investigations, Book 3, Chap. A7, 28 p.

_____1969, Discharge measurements at gaging stations: U.S. Geological Survey Techniques of Water-Resources Investigations, Book 3, Chap. A8, 65 p.

Carter, R. W., and Davidian, Jacob, 1968, General procedure for gaging streams: U.S. Geological Survey Techniques of Water-Resources Investigations, Book 3, Chap. A6, 13 p.

Guy, H. P., 1969, Laboratory theory and methods for sediment analysis: U.S. Geological Survey Techniques of Water-Resources Investigations, Book 5, Chap. C1, 58 p.

Guy, H. P., and Norman, V. W., 1970, Field methods for measurement of fluvial sediment: U.S. Geological Survey Techniques of Water-Resources Investigations, Book 3, Chap. C2, 59 p.

Instrumentation Specialty Company, 1980, Wastewater samplers: catalog 60-2013-109, 16 p.

Kennedy, E. J., 1983, Discharge ratings at gaging stations: U.S. Geological Survey Techniques of Water-Resources Investigations, Book 3, Chap. A10, (in press).

_____1983, Computation of continuous discharge records: U.S. Geological Survey Techniques of Water-Resources Investigations, Book 3, Chap. A13, (in press).

Skougstad, M. W., Fishman, M. J., Friedman, L. C., Erdmann, D. E., and Duncan, S. S., editors 1979, Methods for determination of inorganic substances in water and fluvial sediments: U.S. Geological Survey Techniques of Water-Resources Investigations, Book 5, Chap. A1, 626 p.

HYDROLOGIC DATA

Table 1.--Streamflow data for Johnson Brook at South Albion, Maine, 1980 and 1981 water years.

01049130 JOHNSON BROOK AT SOUTH ALBION, ME

LOCATION.--Lat 44°29'53", long 69°29'12", Kennebec County, Hydrologic Unit 01030003, on right bank approximately 0.8 mi (1.3 km) downstream from Dutton Pond and approximately 0.5 mi (0.8 km) southwest of Albion.

DRAINAGE AREA.--2.92 mi² (7.56 km²).

PERIOD OF RECORD.--May 1980 to current year.

GAGE.--Water-stage recorder. Altitude of gage is 230 ft (70 m), from topographic map.

REMARKS.--Records good except those for the 1981 winter period which are fair.

EXTREMES FOR 1980 WATER YEAR MAY 12 to SEPT. 30.--Maximum discharge 11 ft3/s (0.312 m³/s) May 13, gage height 8.88 ft (2.707 m); minimum discharge, .01 ft³/s (.001 m³/s) most of the time from Aug. 10 to Sept. 25.

EXTREMES FOR CURRENT YEAR.--Peak discharges above base 30 ft³/s (0.850 m³/s) and maximums (°):

Date	Time	Discharge (ft³/s)	Discharge (m³/s)	Gage height (ft)	Gage height (m)	Date	Time	Discharge (ft³/s)	Discharge (m³/s)	Gage height (ft)	Gage height (m)
Feb. 2	1700	* 40	1.13	*a 9.94	3.030	Jun 21	1930	31	0.88	9.56	2.914

a Ice jam

Minimum discharge, 0.06 ft³/s (0.002 m³/s) Oct. 2,3, 7.87 ft (2.399 m).

Discharge, in cubic feet per second, water year October 1979 to September 1980

Mean Values

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1								---	.96	.45	.16	.01
2								---	.91	.40	.10	.01
3								---	.91	.35	.35	.01
4								---	1.1	.32	.32	.01
5								---	.90	.29	.14	.01
6								---	.85	.29	.09	.01
7								---	.75	.21	.06	.01
8								---	.70	.18	.03	.01
9								---	.65	.23	.04	.01
10								---	.60	.18	.01	.01
11								---	.58	.16	.01	.01
12								10	.56	.18	.01	.01
13								9.5	.54	.16	.01	.01
14								7.4	.52	.14	.01	.01
15								6.2	.50	.12	.01	.01
16								5.2	1.3	.14	.01	.01
17								4.4	1.0	.16	.01	.01
18								3.9	.60	.12	.01	.01
19								3.8	.47	.07	.01	.01
20								3.3	.45	.06	.01	.01
21								3.0	2.0	.07	.01	.01
22								2.6	1.1	.29	.01	.01
23								2.3	.65	.26	.01	.01
24								2.0	.55	.18	.01	.01
25								1.7	.55	.10	.01	.01
26								1.5	1.1	.06	.01	.02
27								1.4	.70	.06	.01	.06
28								1.3	.56	.06	.01	.06
29								1.2	.52	.09	.01	.06
30								1.1	.50	.64	.01	.07
31								1.1	---	.29	.01	---
TOTAL								---	23.08	6.31	1.51	.52
MEAN								---	.77	.20	.049	.017
MAX								---	2.0	.64	.35	.07
MIN								---	.45	.06	.01	.01
CFSM								---	.26	.07	.02	.006
IN.								---	.29	.08	.02	.01

Table 1.--Streamflow data for Johnson Brook at South Albion, Maine, 1980 and 1981 water years--Continued

01049130 JOHNSON BROOK AT SOUTH ALBION, ME

Discharge, in cubic feet per second, water year October 1980 to September 1981

Mean Values

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	.07	2.3	19	.83	.49	8.8	4.9	4.2	2.2	2.8	2.8	.68
2	.07	2.0	16	.80	15	8.3	11	4.0	1.9	2.3	2.4	.60
3	.07	1.9	14	.77	14	7.0	11	3.7	1.7	2.0	2.1	.52
4	1.1	1.7	14	.75	9.0	6.2	11	3.3	1.6	1.6	1.6	.49
5	.56	1.7	11	.73	7.2	5.7	11	3.1	1.5	2.3	1.5	.49
6	.35	1.5	9.3	.70	6.2	5.3	13	3.0	1.4	2.7	1.5	.42
7	.32	1.4	7.9	.69	5.7	5.2	12	2.7	1.5	2.3	1.4	.42
8	.32	1.7	6.4	.67	5.2	5.0	12	2.3	1.2	2.0	1.2	.35
9	.32	1.7	6.1	.65	4.6	4.9	10	2.2	2.5	1.6	1.2	.68
10	.29	1.6	5.2	.63	4.4	4.7	8.8	2.0	2.2	1.3	1.1	.52
11	.29	1.6	4.5	.62	11	4.4	7.7	1.9	1.8	1.1	1.0	.49
12	.77	1.6	3.5	.60	24	4.1	6.6	1.5	1.7	.96	.91	.45
13	.56	1.5	3.0	.58	21	3.8	5.7	6.8	1.5	.96	.86	.45
14	.49	1.5	2.8	.57	18	3.7	5.3	4.7	1.3	1.1	.77	.42
15	.45	1.5	2.5	.56	15	3.1	5.7	4.6	1.1	.91	.96	.38
16	.45	1.5	2.2	.56	11	3.3	5.0	11	1.1	.77	5.9	.35
17	.42	1.5	2.0	.55	9.0	2.6	4.9	11	1.0	.68	3.1	.26
18	.68	1.5	1.8	.54	8.5	2.6	5.0	11	.86	.64	3.2	.26
19	.96	1.6	1.7	.54	7.9	2.3	4.7	9.0	.77	.60	2.9	.38
20	.77	1.6	1.6	.53	8.8	2.2	4.4	7.4	.86	.52	2.5	.49
21	.73	1.6	1.5	.52	11	2.1	4.2	5.7	5.9	5.3	2.1	.35
22	.68	1.7	1.4	.52	12	1.9	3.9	4.9	9.0	5.2	1.7	.49
23	.68	1.8	1.3	.52	11	1.8	3.5	4.2	9.5	5.2	1.4	1.2
24	.64	2.0	1.2	.52	9.7	1.7	4.1	3.3	8.5	4.6	1.3	1.5
25	1.2	15	1.1	.51	8.8	1.7	4.2	3.0	6.8	3.8	1.2	1.3
26	3.9	12	1.1	.51	8.5	1.7	4.0	2.7	7.9	2.9	1.2	1.1
27	2.3	12	1.0	.51	10	2.0	3.8	2.4	6.4	3.4	1.1	1.1
28	2.7	11	1.0	.51	9.0	2.8	3.4	2.2	5.3	2.7	.91	1.3
29	2.9	23	.96	.50	---	3.2	3.7	2.0	4.5	4.4	.82	1.1
30	2.8	20	.92	.49	---	3.7	4.7	2.0	3.4	3.8	.77	1.0
31	2.6	---	.88	.49	---	4.9	---	2.5	---	3.5	.73	---
TOTAL	30.44	133.0	148.86	18.47	285.99	120.7	199.2	134.3	96.89	73.94	52.13	19.54
MEAN	.98	4.43	4.80	.60	10.2	3.89	6.64	4.33	3.23	2.39	1.68	.65
MAX	3.9	23	19	.83	24	8.8	13	11	9.5	5.3	5.9	1.5
MIN	.07	1.4	.88	.49	.49	1.7	3.4	1.5	.77	.52	.73	.26
CFSM	.34	1.52	1.64	.21	3.49	1.33	2.27	1.48	1.11	.82	.58	.22
IN.	.39	1.69	1.90	.24	3.64	1.54	2.54	1.71	1.23	.94	.66	.25

WTR YR 1981 TOTAL 1313.46 MEAN 3.60 MAX 24 MIN .07 CFSM 1.23 IN 16.73

Table 2.--Water-quality data from Johnson Brook at South Albion, Maine, 1980 and 1981 water years

Date	Time	Stream-flow, instan-taneous (ft^3/s)	Phos-phorus, total, EWI-ETR samples (mg/L)	Phos-phorus, total, pumping sampler (mg/L)	Sedi-ment, sus-pended (mg/L)	Temper-ature (deg C)	Spe-cific con-duct ance (umhos)
MAR . 1980							
18...	1030	E53	--	--	33	.0	57
18...	1150	E58	4.40	--	34	.0	62
18...	1313	E45	--	--	17	.0	60
18...	1505	E40	--	--	17	.0	62
19...	0535	E25	--	--	11	--	63
APR							
04...	1210	6.3	.090	--	29	3.0	77
04...	1510	6.7	.100	--	41	2.5	86
04...	1550	9.2	.130	--	47	--	86
04...	1655	9.6	.150	--	59	--	99
04...	1900	10	.110	--	56	--	96
04...	1940	--	.022	--	--	--	--
05...	0600	--	.054	--	18	--	81
07...	1500	--	.059	--	9	--	86
10...	0525	8.8	.042	--	14	--	90
10...	1130	10	.065	--	24	--	105
10...	1330	12	.070	--	27	--	105
10...	1430	12	.096	--	42	5.0	110
10...	1550	15	.130	--	67	--	112
10...	1730	17	.180	--	110	5.0	123
10...	1930	18	.110	--	87	--	121
10...	2030	20	.210	--	127	--	122
10...	2150	20	.240	--	84	--	119
11...	0610	18	.074	--	26	--	106
11...	1500	--	.054	--	15	--	95
12...	1720	--	.040	--	8	--	90
29...	1930	--	.033	--	13	--	90
30...	0645	--	.041	--	30	--	93
30...	1605	--	.036	--	16	--	94
MAY							
15...	1100	6.2	--	--	15	15.0	105
JUN							
08...	1240	--	--	.260	--	--	--
09...	1440	--	--	.400	--	--	--
12...	1440	--	--	.270	--	--	--
14...	1440	--	--	.390	--	--	--
JUL							
03...	1420	.35	--	--	--	22.0	120
18...	1445	.10	--	.240	--	--	--
20...	1445	.06	--	.570	--	--	--
21...	0245	.05	--	.370	--	--	--
21...	1445	.06	--	.260	--	--	--
22...	0245	.16	--	.560	--	--	--

E - estimated value

Table 2.--Water-quality data from Johnson Brook at South Albion, Maine, 1980 and 1981 water years--Continued

Date	Time	Stream-flow, instan-taneous (ft^3/s)	Phos-phorus, total, EWI-ETR samples (mg/L)	Phos-phorus, total, pumping sampler (mg/L)	Sedi-ment, sus-pended (mg/L)	Temper-ature (deg C)	Spe-cific con-duct ance (umhos)
JUL , 1980							
22...	1445	.29	--	.500	--	--	--
23...	0245	.29	--	.360	--	--	--
23...	1445	.23	--	.260	--	--	--
24...	0245	.21	--	.170	--	--	--
24...	1445	.18	--	.210	--	--	--
25...	0245	.12	--	.290	--	--	--
25...	1445	.10	--	.270	--	--	--
26...	0245	.06	--	.410	--	--	--
26...	1445	.06	--	.240	--	--	--
27...	0245	.06	--	.120	--	--	--
27...	1445	.06	--	.150	--	--	--
28...	0245	.06	--	.140	--	--	--
28...	1445	.06	--	.150	--	--	--
29...	0245	.05	--	.170	--	--	--
29...	1445	.05	--	.220	--	--	--
29...	2130	.18	--	--	17	--	--
30...	0245	1.0	--	.260	--	--	--
31...	1440	.26	--	.300	--	--	--
31...	1500	.26	.100	--	--	--	--
AUG							
03...	1440	.09	--	.520	--	--	--
03...	1840	.77	--	--	43	--	--
04...	0240	.45	--	.540	--	--	--
04...	1440	.26	--	.340	--	--	124
06...	1440	.09	--	.280	--	--	--
07...	1020	.07	--	--	--	23.0	124
09...	0240	.03	--	.130	--	--	--
11...	0240	.01	--	.200	--	--	--
12...	1515	.01	--	.230	--	--	--
13...	0315	.01	--	.380	--	--	--
13...	1515	.01	--	.140	--	--	--
14...	0315	.01	--	.120	--	--	--
14...	1515	.01	--	.120	--	--	--
15...	0315	.01	--	.160	--	--	--
15...	1515	.01	--	.130	--	--	--
21...	1300	.01	--	--	8	--	--
SEP							
04...	1700	.01	.160	--	--	16.0	210
17...	0440	.01	--	.230	--	--	--
18...	0440	.01	--	.130	--	--	--
18...	1640	.01	--	.100	--	--	--

Table 2.--Water-quality data from Johnson Brook at South Albion, Maine, 1980 and 1981 water years--Continued

Date	Time	Stream-flow, instan-taneous (ft^3/s)	Phos-phorus, total, EWI-ETR samples (mg/L)	Phos-phorus, total, pumping sampler (mg/L)	Sedi-ment, sus-pended (mg/L)	Temper-ature (deg C)	Spe-cific con-duct ance (umhos)
SEP , 1980							
22...	1640	.01	--	.120	--	--	--
23...	0440	.01	--	.080	--	--	--
23...	1640	.01	--	.120	--	--	--
24...	0440	.01	--	.120	--	--	--
24...	1640	.01	--	.120	--	--	--
26...	0945	.42	--	--	27	--	190
26...	1000	.49	--	--	26	--	190
26...	1100	.42	--	--	24	--	200
26...	1200	.32	--	--	16	--	210
26...	1640	.18	--	.320	--	--	--
27...	1640	.05	--	.720	--	--	--
28...	0440	.06	--	.720	--	--	--
28...	1640	.06	--	.950	--	--	--
29...	0440	.06	--	.990	--	--	--
29...	1640	.06	--	1.20	--	--	--
OCT							
03...	0445	.07	--	1.60	--	--	--
03...	1210	.07	--	--	--	12.0	427
03...	1645	.07	--	1.70	--	--	--
04...	0445	.77	--	1.40	--	--	--
04...	1645	1.3	--	1.30	--	--	--
05...	0445	.64	--	1.30	--	--	--
05...	1645	.49	--	1.20	--	--	--
07...	1645	.32	--	2.60	--	--	--
08...	1645	.32	--	2.60	--	--	--
10...	1645	.26	--	1.90	--	--	--
11...	0445	.26	--	2.30	--	--	--
11...	1645	.38	--	2.60	--	--	--
12...	0445	.86	--	4.80	--	--	--
12...	1645	.82	--	3.60	--	--	--
13...	0445	.60	--	2.20	--	--	--
15...	1645	.45	--	1.10	--	--	--
16...	0445	.45	--	.940	--	--	--
16...	1645	.45	--	.800	--	--	--
17...	0445	.42	--	1.20	--	--	--
17...	1645	.42	--	1.00	--	--	--
18...	0445	.42	--	1.00	--	--	--
20...	0445	.82	--	.600	--	--	--
23...	0445	.68	--	.360	--	--	--
24...	1645	.64	--	.280	--	--	--

Table 2.--Water-quality data from Johnson Brook at South Albion, Maine, 1980 and 1981 water years--Continued

Date	Time	Stream-flow, instan-taneous (ft^3/s)	Phos-phorus, total, EWI-ETR samples (mg/L)	Phos-phorus, total, pumping sampler (mg/L)	Sedi-ment, sus-pended (mg/L)	Temper-ature (deg C)	Spe-cific con-duct ance (umhos)
OCT , 1980							
25...	0445	.60	--	.260	--	--	--
25...	1645	.56	--	.200	--	--	--
26...	0445	9.5	--	2.00	--	--	--
26...	0845	6.4	--	--	18	7.0	150
26...	1130	4.6	--	--	17	7.0	160
26...	1645	3.2	--	.800	--	--	--
27...	0445	2.3	--	.900	--	--	--
27...	1130	2.3	.320	--	7	5.5	190
28...	0445	2.5	--	.130	--	--	--
30...	1100	2.8	--	--	--	5.0	102
31...	1545	2.5	--	.360	--	--	102
NOV							
01...	0345	2.3	--	.170	--	--	--
01...	1545	2.3	--	.170	--	--	--
06...	0345	1.5	--	.200	--	--	--
06...	1545	1.5	--	.170	--	--	--
07...	0345	1.5	--	.210	--	--	--
07...	1545	1.3	--	.150	--	--	--
07...	1600	1.3	--	--	5	6.0	105
08...	0345	1.7	--	.150	--	--	--
08...	1545	1.8	--	.140	--	--	--
13...	1545	1.5	--	.160	--	--	--
14...	0345	1.5	--	.180	--	--	--
14...	1545	1.5	--	.140	--	--	--
15...	0345	1.5	--	.200	--	--	--
15...	1545	1.5	--	.160	--	--	--
22...	1545	1.6	--	.640	--	--	--
24...	1315	1.8	.045	--	4	2.0	107
24...	1420	1.8	--	.550	--	--	--
24...	1440	1.9	--	.225	--	--	--
24...	1700	2.0	--	.110	--	--	--
24...	1800	2.0	--	.110	--	--	--
24...	1900	2.0	--	.100	--	--	--
24...	2000	2.0	--	.240	--	--	--
24...	2015	2.0	--	--	23	1.5	135
24...	2100	2.2	--	.120	--	--	--
24...	2130	2.3	--	--	23	1.5	132
24...	2200	2.5	--	.160	--	--	--
24...	2245	2.9	.190	--	26	1.5	135
24...	2300	3.0	--	.140	--	--	--

Table 2.--Water-quality data from Johnson Brook at South Albion, Maine, 1980 and 1981 water years--Continued

Date	Time	Stream-flow, instan-taneous (ft^3/s)	Phos-phorus, total, EWI-ETR samples (mg/L)	Phos-phorus, total, pumping sampler (mg/L)	Sedi-ment, sus-pended (mg/L)	Temper-ature (deg C)	Spe-cific con-duct ance (umhos)
NOV , 1980							
24...	2345	3.5	--	--	31	1.5	135
24...	2400	3.7	--	.150	--	--	--
25...	0100	4.2	--	.240	--	--	--
25...	0140	4.7	--	--	41	1.5	156
25...	0200	5.0	--	.280	--	--	--
25...	0300	5.9	--	.460	--	--	--
25...	0400	7.2	--	.420	--	--	--
25...	0415	7.7	--	--	36	1.5	145
25...	0500	9.0	--	.460	--	--	--
25...	0600	9.7	--	.370	--	--	--
25...	0650	15	.660	--	63	1.5	135
25...	0700	16	--	.700	--	--	--
25...	0710	17	--	--	60	1.5	130
25...	0800	22	--	.550	--	--	--
25...	0900	23	--	.650	--	--	--
25...	1000	23	--	.650	--	--	--
25...	1100	23	--	1.05	--	--	--
25...	1120	22	--	--	30	2.0	127
25...	1200	22	--	.600	--	--	--
25...	1230	21	--	--	19	1.5	125
25...	1300	21	--	.600	--	--	--
25...	1400	20	--	.600	--	--	--
25...	1425	19	--	--	13	1.5	--
25...	1535	18	--	--	12	3.0	120
25...	1600	17	--	.650	--	--	--
25...	1635	16	--	--	12	1.5	--
25...	1700	15	--	.460	--	--	--
25...	1715	15	--	.490	--	--	--
26...	0515	12	--	.490	--	--	--
26...	1415	12	.120	--	5	2.5	95
26...	1715	12	--	.170	--	--	--
DEC							
10...	1315	4.0	--	--	--	1.0	105
18...	1030	1.8	.026	--	--	--	--
19...	1300	1.7	.031	--	5	--	130
21...	1715	1.5	--	.560	--	--	--
22...	0515	1.4	--	.160	--	--	--
22...	1715	1.4	--	.400	--	--	--
26...	0515	1.1	--	.170	--	--	--
26...	1715	1.1	--	.270	--	--	--

Table 2.--Water-quality data from Johnson Brook at South Albion, Maine, 1980 and 1981 water years--Continued

Date	Time	Streamflow, instantaneous (ft^3/s)	Phosphorus, total, EWI-ETR samples (mg/L)	Phosphorus, total, pumping sampler (mg/L)	Sediment, suspended (mg/L)	Temperature (deg C)	Specific conductance (umhos)
DEC , 1980							
27...	1715	1.0	--	.150	--	--	--
JAN , 1981							
01...	1715	.83	--	.140	--	--	--
02...	1715	.80	--	.140	--	--	--
03...	0515	.77	--	.180	--	--	--
28...	1430	.51	--	--	5	.0	120
28...	1515	.51	.040	--	--	--	--
FEB							
02...	0730	2.0	.570	--	26	.0	160
02...	1220	22	1.00	--	31	1.0	123
02...	1315	24	1.60	--	30	.5	185
02...	1415	28	2.30	--	36	.5	210
02...	1530	33	2.50	--	47	.5	200
02...	1625	38	3.10	--	58	.5	187
02...	2000	25	2.50	--	42	1.0	168
02...	2050	23	2.40	--	--	--	--
02...	2130	22	2.40	--	--	--	--
02...	2200	22	2.10	--	35	1.0	174
03...	0930	16	.650	--	9	--	--
03...	1640	12	.290	--	13	.0	100
04...	1640	9.0	.110	--	6	.0	94
05...	1110	8.3	.195	--	12	--	--
06...	1445	6.2	.170	--	9	--	--
10...	1400	5.0	.057	--	5	--	--
11...	0745	4.2	.066	--	4	.0	125
11...	1220	9.0	.800	--	40	.0	165
11...	1400	12	1.80	--	--	.0	220
11...	1630	17	2.00	--	62	.0	224
11...	1800	18	1.90	--	17	.5	200
11...	2000	20	1.30	--	59	.5	185
11...	2200	25	1.20	--	73	.5	165
11...	2330	29	1.10	--	--	1.0	151
12...	0200	28	.500	--	25	1.0	130
12...	0430	26	.340	--	28	1.0	119
12...	0925	23	.180	--	30	--	--
13...	1630	21	.110	--	16	.5	125
18...	1430	8.1	.046	--	--	--	--
19...	1630	7.7	.042	--	5	3.5	125
20...	0600	7.7	.037	--	7	--	135
20...	0945	8.1	.045	--	--	--	--
23...	1645	10	.025	--	5	4.5	112

Table 2.--Water-quality data from Johnson Brook at South Albion, Maine, 1980 and 1981 water years--Continued

Date	Time	Stream-flow, instan-taneous (ft^3/s)	Phos-phorus, total, EWI-ETR samples (mg/L)	Phos-phorus, total, pumping sampler (mg/L)	Sedi-ment, sus-pended (mg/L)	Temper-ature (deg C)	Spe-cific con-duct ance (umhos)
FEB , 1981							
24...	0515	10	.024	--	7	--	102
24...	1630	9.5	.026	--	4	--	158
25...	1000	8.8	.025	--	4	--	--
27...	1030	9.3	.039	--	6	2.5	90
MAR							
04...	1345	6.1	.023	--	--	--	92
13...	1200	3.5	.025	--	4	--	--
19...	1330	2.1	.025	--	4	2.0	110
23...	1045	1.7	--	--	2	--	--
24...	1155	1.7	--	--	--	5.5	105
APR							
02...	1015	11	.210	--	53	--	--
02...	1030	11	--	.295	--	--	--
02...	1415	11	.170	--	27	--	--
02...	1800	12	.120	--	14	--	115
03...	1230	11	.047	--	8	7.5	--
07...	1000	12	.033	--	4	--	--
07...	1005	12	--	.041	--	--	--
10...	1000	9.3	--	.043	--	--	--
12...	1000	6.8	--	.039	--	--	--
14...	0553	5.2	.028	--	3	5.5	108
14...	1000	5.0	--	.036	--	--	--
14...	1550	5.2	.041	--	6	6.0	122
14...	1650	5.2	--	.100	--	--	--
14...	1750	5.3	--	.061	--	--	--
14...	1850	5.7	--	.054	--	--	--
14...	1950	5.7	--	.051	--	--	--
14...	2050	5.9	--	.043	--	--	--
14...	2150	5.9	--	.041	--	--	--
14...	2205	5.9	.037	--	6	6.5	126
14...	2350	6.1	--	.042	--	--	--
15...	0150	6.1	--	.037	--	--	--
15...	0350	6.1	--	.045	--	--	--
15...	0550	6.1	--	.033	--	--	--
15...	0750	5.7	--	.034	--	--	--
15...	0950	5.7	--	.036	--	--	--
16...	1115	5.0	.022	--	26	--	--
18...	0900	4.7	.027	--	4	7.5	121
20...	1445	4.4	.028	--	4	7.0	116
23...	1545	3.4	.039	--	8	11.0	119
24...	0530	3.9	.033	--	10	7.0	129

Table 2.--Water-quality data from Johnson Brook at South Albion, Maine, 1980 and 1981 water years--Continued

Date	Time	Stream-flow, instan-taneous (ft^3/s)	Phos-phorus, total, EWI-ETR samples (mg/L)	Phos-phorus, total, pumping sampler (mg/L)	Sedi-ment, sus-pended (mg/L)	Temper-ature (deg C)	Spe-cific con-duct ance (umhos)
APR , 1981							
28...	1520	3.3	.035	--	8	15.0	150
29...	0740	3.3	.039	--	8	10.0	150
30...	0725	4.9	.059	--	--	9.0	140
MAY							
06...	1345	2.9	.058	--	--	18.0	115
11...	1950	1.6	--	.080	--	--	--
12...	0750	1.5	--	.100	--	--	--
12...	1950	1.5	--	.100	--	--	--
13...	0750	10	--	.150	--	--	--
13...	0945	8.3	.130	--	24	--	--
13...	1045	7.4	.110	--	--	--	--
13...	1200	6.4	.090	--	--	12.5	110
13...	1230	6.1	.090	--	--	--	--
14...	0750	4.6	--	.067	--	--	--
14...	0945	4.7	.047	--	--	12.0	117
15...	0750	4.6	--	.062	--	--	--
15...	1445	4.6	.048	--	9	13.5	124
15...	2335	4.2	--	.070	58	--	--
16...	0135	5.0	--	.120	68	--	--
16...	0335	8.5	--	.130	46	--	--
16...	0530	9.7	.130	--	29	14.0	120
16...	0535	10	--	.140	35	--	120
16...	1030	12	.110	--	--	--	--
16...	1145	14	.130	--	--	--	--
16...	1215	15	.150	--	--	--	--
16...	1640	13	.110	--	--	--	--
17...	0630	12	.071	--	--	13.0	110
18...	0640	10	--	.017	--	--	--
18...	0645	11	.041	--	17	10.0	104
18...	1840	10	--	.057	--	--	--
19...	0640	9.5	--	.049	--	--	--
19...	1600	8.8	.043	--	--	--	--
19...	1840	8.5	--	.052	--	--	--
20...	0640	7.4	--	.055	--	--	--
21...	1415	5.7	.039	--	9	18.0	90
29...	1435	2.0	.059	--	5	19.5	137
31...	1105	2.7	.070	--	8	17.5	140
31...	1415	3.0	.066	--	7	--	--
JUN							
01...	1000	2.2	.061	--	3	--	--
01...	1510	2.0	--	.080	14	--	--

Table 2.--Water-quality data from Johnson Brook at South Albion, Maine, 1980 and 1981 water years--Continued

Date	Time	Stream-flow, instan-taneous (ft^3/s)	Phos-phorus, total, EWI-ETR samples (mg/L)	Phos-phorus, total, pumping sampler (mg/L)	Sedi-ment, sus-pended (mg/L)	Temper-ature (deg C)	Spe-cific con-duct ance (umhos)
JUN , 1981							
04...	1445	1.5	.054	--	4	--	130
04...	1510	1.5	--	.045	14	--	--
05...	0310	1.6	--	.044	12	--	--
06...	0310	1.3	--	.070	5	--	--
06...	1510	1.1	--	.058	13	--	--
09...	0610	1.1	.053	--	--	17.0	144
09...	1415	3.5	.130	--	--	--	--
09...	1545	4.7	.090	--	--	22.0	117
09...	1930	3.8	.061	--	--	--	--
10...	0225	3.0	--	.070	--	--	--
10...	1425	2.0	--	.048	--	--	--
11...	0225	1.8	--	.050	--	--	--
11...	1425	1.8	--	.048	--	--	--
14...	0225	1.5	--	.053	--	--	--
15...	0955	1.1	.061	--	--	19.0	116
16...	0225	1.1	--	.120	--	--	--
18...	1130	.86	.070	--	--	--	--
19...	1930	.73	--	.050	--	--	--
20...	1130	.64	--	.055	--	--	--
21...	0330	2.4	--	.043	--	--	--
21...	1930	24	--	.074	--	--	--
21...	2040	26	.340	--	34	--	90
21...	2300	19	--	.190	--	--	--
22...	0100	16	--	.230	--	--	--
22...	0300	13	--	.240	--	--	--
22...	0500	9.7	--	.240	--	--	--
22...	0700	7.9	--	.260	--	--	--
22...	1345	7.0	.150	--	--	17.5	100
23...	0705	9.5	.100	--	5	17.0	94
24...	1000	8.8	--	.060	--	--	--
24...	2200	7.9	--	.068	--	--	--
25...	1000	6.8	--	.059	--	--	--
25...	2200	6.2	--	.055	--	--	--
26...	1000	8.8	--	.110	--	--	--
26...	2200	7.0	--	.080	--	--	--
27...	1000	6.4	--	.060	--	--	--
JUL							
01...	1315	2.8	.063	--	8	23.0	105
05...	1130	2.4	.100	--	9	20.0	127
06...	0815	2.7	.140	--	5	18.5	142

Table 2.--Water-quality data from Johnson Brook at South Albion, Maine, 1980 and 1981 water years--Continued

Date	Time	Stream-flow, instan-taneous (ft^3/s)	Phos-phorus, total, EWI-ETR samples (mg/L)	Phos-phorus, total, pumping sampler (mg/L)	Sedi-ment, sus-pended (mg/L)	Temper-ature (deg C)	Spe-cific con-duct ance (umhos)
JUL , 1981							
06...	1000	2.7	.130	--	7	--	--
13...	1515	1.1	.070	--	4	20.0	129
15...	1230	.82	--	--	--	21.0	127
20...	0645	.56	.068	--	3	--	--
20...	1745	.52	--	--	--	19.0	149
20...	2335	.52	--	.049	4	--	--
21...	0615	2.3	.090	--	--	17.5	159
21...	0835	2.5	--	.080	15	--	--
21...	1130	3.9	.190	--	64	--	--
21...	1750	15	.460	--	122	20.0	101
21...	1800	18	--	.720	240	--	--
21...	2210	12	.380	--	16	--	--
22...	0715	4.7	.470	--	10	18.5	128
23...	0650	5.3	.140	--	4	18.0	107
24...	0645	4.7	.090	--	3	17.0	104
24...	1415	4.5	--	--	6	--	--
27...	0615	3.9	.090	--	7	19.0	138
28...	1015	2.7	.090	--	3	--	--
29...	0500	4.2	--	--	--	17.0	138
29...	1700	4.4	.090	--	5	17.0	120
30...	1545	3.8	.080	--	3	--	--
AUG							
03...	1530	2.0	.100	--	9	--	--
05...	1445	1.3	.100	--	5	--	--
09...	1500	1.1	.080	--	--	--	--
12...	0300	.96	.077	--	--	--	--
14...	0915	.82	.063	--	--	--	--
15...	1645	.68	.059	--	4	20.0	155
16...	0600	6.2	.370	--	30	--	--
16...	0745	15	.570	--	41	--	--
16...	1630	4.7	.290	--	8	--	--
17...	1430	2.9	.140	--	5	--	--
19...	1430	2.7	.069	--	5	--	--
21...	1445	2.1	.080	--	--	--	--
24...	1445	1.3	.061	--	--	--	--
25...	1420	1.1	--	--	--	19.0	115
28...	1000	.96	.053	--	6	--	--
SEP							
04...	0930	.52	.067	--	11	--	--
08...	0945	.35	.077	--	7	--	--
11...	1330	.49	.073	--	21	--	--

Table 2.--Water-quality data from Johnson Brook at South Albion, Maine, 1980 and 1981 water years--Continued

Date	Time	Stream-flow, instan-taneous (ft^3/s)	Phos-phorus, total, EWI-ETR samples (mg/L)	Phos-phorus, total, pumping sampler (mg/L)	Sedi-ment, sus-pended (mg/L)	Temper-ature (deg C)	Spe-cific con-duct ance (umhos)
SEP , 1981							
17...	1500	.29	.067	--	2	18.0	150
22...	1400	.32	.064	--	2	11.0	--
23...	0850	.96	.080	--	4	--	--
23...	1740	1.7	.140	--	13	--	--
24...	0930	1.7	.190	--	19	--	--
24...	1600	2.0	.240	--	100	--	--
28...	0600	1.4	.080	--	4	--	--

Table 3.--Daily precipitation data in the Johnson Brook basin, October 1980 to September 1981.

	Precipitation, in inches											
	1980			1981								
Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	--	--	--	--	--	--	--	--	--	--	--	--
2	--	--	--	.22[a]	b	b	.94	--	--	--	--	--
3	.16	--	.45	--	b	b	--	--	--	--	--	--
4	1.05	.07	--	--	--	--	--	--	.17	.87	--	--
5	--	--	--	--	--	--	--	--	--	--	.44	--
6	--	--	--	--	b	b	.43	--	.30	.30	.04	--
7	--	.37	--	.39[a]	--	b	--	--	--	--	--	--
8	.11	--	.05	--	b	--	--	--	--	--	--	--
9	--	--	--	--	b	--	--	--	.97	--	.03	.61
10	--	.07	.07[a]	--	--	--	--	--	--	--	.01	.17
11	--	--	--	--	b	b	.02	--	.10	--	--	--
12	.68	--	--	.13[a]	--	--	--	--	.08	--	--	--
13	--	--	.17[a]	--	--	--	--	1.15	--	.37	--	--
14	--	--	--	--	--	--	.42	--	--	--	--	--
15	--	--	--	--	--	--	--	--	--	--	2.21	.51
16	--	--	.16[a]	--	--	--	--	1.16	.10	--	--	--
17	.50	--	--	--	--	--	--	.24	--	--	.38	--
18	--	.48[a]	--	--	--	b	.18	--	--	.31	--	--
19	--	--	.16[a]	--	--	--	--	--	--	--	--	--
20	--	--	--	--	b	b	--	.76	--	--	--	
21	--	--	--	--	b	b	--	--	1.64	2.53	--	--
22	--	--	.09[a]	.05[a]	--	--	--	--	.26	--	--	--
23	--	--	--	--	--	--	--	--	--	--	--	--
24	--	1.40	.10[a]	--	--	--	.52	--	--	--	.13	1.92
25	--	--	--	--	--	--	--	--	.51	--	--	--
26	1.80	--	--	--	b	--	--	--	--	--	--	--
27	--	--	--	--	b	.60[a]	--	--	--	--	--	--
28	.04	1.31	--	--	--	--	--	--	--	--	--	.27
29	--	--	.07[a]	--		--	.60	.09	--	--	--	--
30	--	--	--	--		.23	--	--	--	--	--	--
31	--		--	--		--		.53		--	--	
Total	4.34	3.70	1.32	0.79	[c]	[c]	3.11	3.17	4.89	4.38	3.24	3.48

a precipitation as snow reported as water equivalent
b precipitation occurred but amount not measured due to instrument malfunction.
c incomplete record in month