

SURFACE WATER

WATER QUALITY

LOW-FLOW PARTIAL-RECORD STATIONS AND MISCELLANEOUS MEASUREMENT SITES

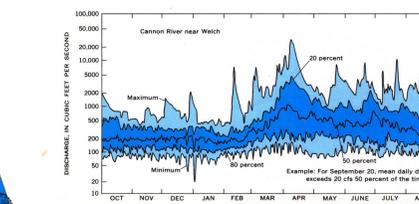
Letter key	Low-flow stations and miscellaneous sites	Drainage area, sq mi (approximate)	Estimated 7-day minimum discharge (cfs) (2-year recurrence interval)	Estimated mean annual discharge (cfs)	Estimated water year peak discharge (cfs) (10-year recurrence interval)
F	5-3538-1 Turtle Creek near Owatonna	41	0.1	3	.....
G	..... Straight River at Owatonna	210	9	80	9,200
H	5-3529 Maple Creek at Owatonna	39	1	8	.....
I	..... Crane Creek at Cannon Falls	105	4	36	4,000
J	..... Cannon River at Fairbault	341	7	100	4,200
K	5-3546 Wolf Creek near Dundas	43	1	12	.....
L	5-3550-2 Heath Creek at Northfield	38	<1	1	.....
M	..... Cannon River at Waukegan	915	15	300	11,400
N	5-3550-4 Chub Creek at Randolph	86	3.6	18	.....
O	5-3550-6 Spring Creek near Cannon	11	2	2	.....
P	5-3550-8 Prairie Creek near Cannon	86	5	14	.....
Q	5-3551-4 Little Cannon River near Cannon Falls	89	10	26	.....
D	5-3551-5 *Pine Creek near Cannon Falls	20	3	9	.....
R	5-3552-13 Belle Creek near Vasa	75	5	14	.....

*Percentage partial-record station.
<Less than.

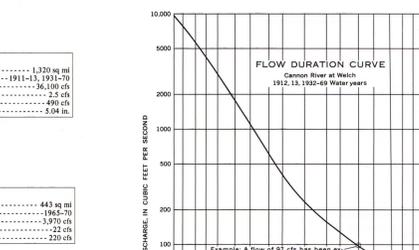
CREST-STAGE PARTIAL-RECORD STATIONS

Letter key	Gaging station	Drainage area (square miles)	Years of record (water years)	Discharge (cfs)
A	5-3527 Turtle Creek tributary No. 2 near Park	1.28	1960-70	220 No flow
B	5-3528 Turtle Creek tributary near Steele Center	5.01	1960-70	369 No flow
C	5-3551 Little Cannon River tributary near Kenyon	2.02	1960-70	1,040 No flow
D	5-3551-3 *Pine Creek near Cannon Falls	20.2	1960-70	844 No flow
E	5-3552-3 Cannon River tributary near Welch	.85	1960-70	80 No flow

*Miscellaneous discharge measurement site.

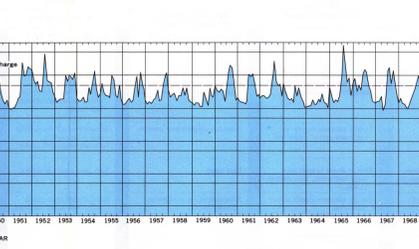


THE VARIATION OF DAILY MEAN DISCHARGE FOR EACH DAY FOR A 19 YEAR PERIOD IS SHOWN BY THE DAILY DURATION HYDROGRAPH.—The smallest range in discharge occurs at the end of January and the beginning of February, whereas, the greatest range is in April. The lowest flows generally occur during the winter and the highest during the spring break-up. The daily discharge was regulated by powerplants above the station prior to December 21, 1966 at which time the powerplants were shut down.



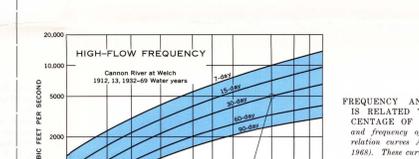
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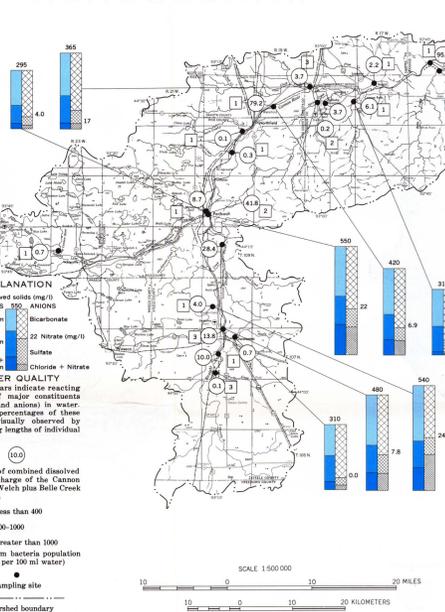
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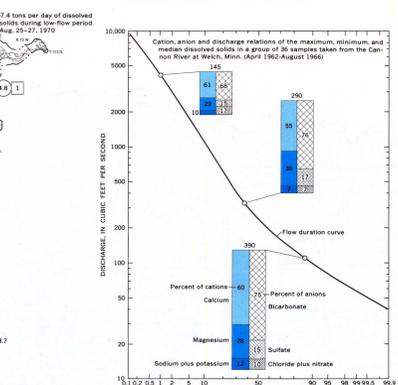


EXPLANATION
Dissolved solids (mg/l)
Calcium 100
Magnesium 22 Nitrate (mg/l)
Sulfate
Sodium + Potassium
Chloride + Nitrate

WATER QUALITY
Lengths of bars indicate reading values of major constituents (cation and anion) in milligrams per liter. Relative percentages of these can be visually observed by comparing lengths of individual bars.

Percentage of combined dissolved solids discharge of the Cannon River at Welch plus Belle Creek near Vasa
Coefficient of correlation = 0.98

Scale: 1:50,000
Watered boundary



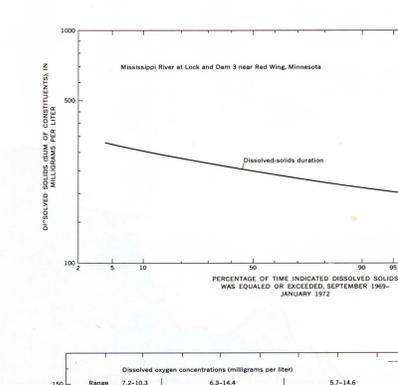
U.S. Public Health Service and Minnesota Pollution Control Agency recommend that dissolved solids not exceed 500 mg/l in drinking water.

Hardness = 0.822 X (specific conductance) - 14
Coefficient of correlation = 0.97
Hardness exceeding 180 mg/l is considered very hard.

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LAKES

THE SELECTED LARGE LAKES, SMALL LAKES, AND MANY STREAMS IN THE WATERSHED ARE AN IMPORTANT ALL-SEASON RECREATIONAL RESOURCE.—They are fish and wildlife habitats and provide for fishing, water sports, and other recreation uses. For fishing, a major

Name (County)	Surface area (acres)	Depth (feet) Max. Avg. or Median	Outlet control	Fish and game classification	Remarks
Hybeshy (Dakota)	1,480	50 9	Dam	Rough fish-warm water game fish	Periodically stocked with walleye, crappie, and sun-fish yearlings.
Francis (LeSueur)	870	60 11	Natural	Rough fish-warm water game fish	Has public access. Periodic stocking with walleye, crappie, and sun-fish yearlings.
German (LeSueur)	975	51 13	Natural	Rough fish-warm water game fish	Has public access. Rough fish removed periodically. Recently stocked with walleye and northern pike fingerlings and yearlings.
German (LeSueur)	590	14	Dam	Rough fish-warm water game fish	Has public access. Rough fish removed periodically. Recently stocked with walleye, crappie, and sun-fish yearlings.
Jefferson (LeSueur)	2,290	38 8	Dam	Rough fish-warm water game fish	Has public access. Rough fish removed periodically. Recently stocked with walleye, crappie, and sun-fish yearlings.
Tetonska (LeSueur)	1,336	35 19	Dam	Rough fish-warm water game fish	Has public access. Rough fish removed periodically. Recently stocked with walleye, crappie, and sun-fish yearlings.
Upper Sakatah (LeSueur)	881	18 9	Dam	Rough fish-warm water game fish	Has public access. Rough fish removed periodically. Recently stocked with walleye, crappie, and sun-fish yearlings.
Cannon (Rice)	1,476	15 10	Dam	Rough fish-warm water game fish	Has public access. Rough fish removed periodically. Recently stocked with walleye and northern pike yearlings.
Cedar (Rice)	927	40 12	Dam	Rough fish-warm water game fish	Has public access. Rough fish removed periodically. Recently stocked with walleye and northern pike yearlings.
Cude (Rice)	976	11 6	Dam	No classification	Has no stocking program.
French (Rice)	842	56 15	Natural	Rough fish-warm water game fish	Has public access. Rough fish removed periodically. Recently stocked with walleye, crappie, and sun-fish yearlings.
Mazaka (Rice)	687	50	Natural	Rough fish-warm water game fish	Has public access. Rough fish removed periodically. Recently stocked with walleye, crappie, and sun-fish yearlings.
Rubens (Rice)	654	38 12	Dam	Rough fish-warm water game fish	Has public access. Rough fish removed periodically. Recently stocked with walleye, crappie, and sun-fish yearlings.
Wau (Rice)	611	33 14	Dam	Rough fish-warm water game fish	Has public access. Rough fish removed periodically. Recently stocked with walleye, crappie, and sun-fish yearlings.

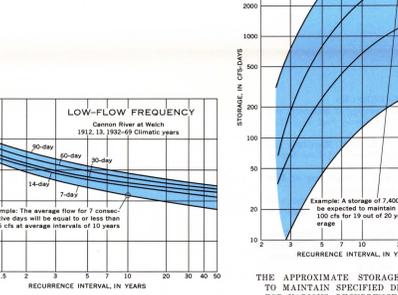
The quality of class 2B interstate waters of the State of Minnesota shall be such as to permit the propagation and maintenance of sport or commercial fishes and suitable for aquatic recreation of all kinds including bathing.

Wing did not exceed 500 mg/l during the indicated period. Low oxygen saturation indicates depletion of oxygen by slow biodegradation and consumption by aquatic animal life under winter ice cover. After spring break-up, aeration establishes a higher level of oxygen, with occasional supersaturation occurring under heavy aquatic plant growth during the summer. Oxygen depletion during months of higher water temperature is a result of rapid biodegradation of municipal and industrial wastes. Other physical, chemical, and biological parameters describing water quality in the Mississippi River (Lock and Dam 3) are indicated below on maximum, minimum, and mean basis for the period beginning November 1952 and ending January 1965.

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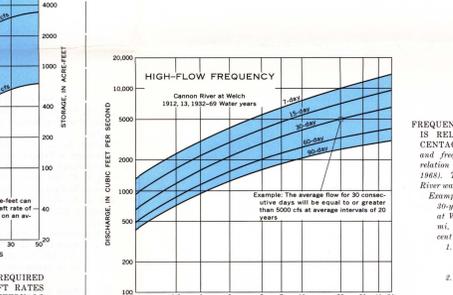
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LOW FLOW



LOW FLOW IS LARGELY FROM GROUND-WATER SOURCES.—The low-flow frequency curves of the Cannon River at Welch indicate that the basin has a sizable ground-water reservoir and that discharge from lakes, springs, and glacial deposits of sand and gravel sustain low flow. These curves can be used to predict the probability of low stream-flow, assuming no change in basin characteristics. The 2-day minimum discharge occurring every 2 years on the average for sites with small drainage areas can be compared by referring to the miscellaneous discharge-measurement sites on the flow diagrams.

HIGH FLOW



HIGH FLOWS ARE FROM SNOWMELT, AUGMENTED AT TIMES BY RAINFALL AND ARE INFLUENCED BY BASIN SHAPE, SIZE, AND TOPOGRAPHY.—However, high flows of short duration may occur at any time as a result of intense storms. Damage from floods are related to the height, duration, frequency, and season in which high flows occur. These are factors considered in the design of flood-control reservoirs and the high-flow frequency curve is useful in solving problems of reservoir design and operation.

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SURFACE WATER QUALITY AT LOW-FLOW CONDITIONS DEFLECTS AREAS OF DIFFERENT ENVIRONMENTAL INFLUENCES IN THE CANNON RIVER WATERSHED.—Substantial increases in dissolved-solids contribution, 3.2 tons per day (2.1 percent at Owatonna and 2.2 tons per day (2.1 percent) at Fairbault; presence of significant concentrations of chloride and nitrate, and fecal coliform populations of 1,000 or greater are indicative of municipal sewage and agricultural

waste discharge to the Straight and Cannon Rivers and their tributaries. Controlled flow at Fairbault and deposition of calcareous carbonate in lakes decrease the contribution of dissolved solids from the Upper Cannon River basin. Tributary streams (Little Cannon River and Belle Creek) draining shallow carbonate bedrock terrace contribute higher percentages of dissolved solids than tributaries draining glacial deposits.

Dissolved solids in water from the Cannon River at Welch varies inversely with stream discharge. Calcium and bicarbonate are the dominant ions, with slight variations in percentage of other cations and anions. Nitrate plus chloride accumulation from barometric runoff is greatest under storm conditions. Extractions of dissolved solids and hardness can be made by measuring specific conductance and using the respective linear graph or by substituting specific conductance in the equation.

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