PREPARED IN COOPERATION WITH THE
COMMONWEALTH OF MASSACHUSETTS
WATER RESOURCES COMMISSION

INTRODUCTION

The Taunton River, formed at the confluence of Matfield and Town Rivers, flows about 36 miles to Mt. Hope Bay, a part of Narragansett Bay at Fall River. The lower 8 or 9 miles is a tidal estuary, above which the river is affected by tides for about 15 miles. Its drainage area (fig. 1) of 528 square miles is flat to gently rolling terrain ranging in altitude from sea level to about 450 feet. It includes all or parts of the cities of Attleboro, Brockton, Fall River, New Bedford, Taunton, and 35 towns. Towns bordering the cities and those in the north, bordering the Boston metropolitan area, are undergoing suburban expansion. A network of state and interstate expressways connecting Boston with Providence, Fall River, New Bedford, and Cape Cod has accelerated growth of the region, particularly along the Boston-Providence segment of the northeast "megalopolis". Population growth, slow until 1945, is accelerating, and predictions indicate that population may increase from the present 325,000 to 500,000 by 1990.

In addition to meeting the water needs generated by predicted population increase, additional water supplies will have to be developed to meet the increasing industrial requirements and higher per capita use. The water shortages experienced during the 1963-67 drought focused public attention on the inadequacies of some sources of supply and distribution systems and increased public interest in developing additional local sources of water and in exploring the possibilities of one or more regional water systems.

This report, based on geological and hydrological data collected from 1966 to 1968, provides information on the water resources of the area. The data will assist in locating additional water supplies for municipal and industrial use, planning regional water districts or a basin-wide water system, and protecting potential water supplies until needed.

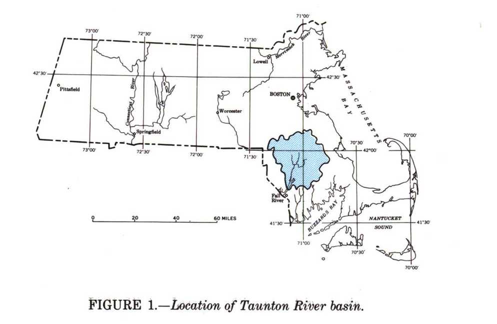

FIGURE 1.—*Location of Taunton River basin.*

SUMMARY

The Taunton River flows to Narragansett Bay at Fall River. The basin's drainage area of 528 square miles includes at least 50 square miles of swamps and about 23 square miles of lakes and ponds, of which more than 50 are great ponds, having an area of at least 10 acres. Six of the seven ponds used for municipal water supply purposes are among the Lakeville Ponds, which, in 1967, furnished an average of 24 mgd (million gallons per day) to New Bedford and Taunton. Other ponds, swamps, and tributary stream valleys provide reservoir sites for impoundment of surface water. The largest potential source of surface water is the Taunton River which, if upgraded in quality and treated, could furnish about 80 mgd from a reservoir in the estuary between Somerset and Freetown.

Streamflow from the basin during the period 1931-65 averaged about 230 billion gallons per year, or about 57 percent of the average annual precipitation. In the lower reaches of the Taunton River aqueduct storage in swamps usually prevents or levels out peak flows; consequently flooding is minor. However, in the upper reaches of the tributaries where storage is relatively small, occasional damaging floods take place. Low flows are maintained by ground water discharge. Less seasonal variation in streamflow is recorded in areas where streams traverse extensive deposits of sand and gravel than in areas underlain by till.

In 1967 the total water pumped from streams, lakes, and surface-water reservoirs was about 178 billion gallons. Of this amount, about 154 billion gallons of fresh and salt water was pumped from the Matfield and lower Taunton Rivers by electric utilities for cooling. An additional 12 billion gallons was pumped by municipal water systems to supply Brockton, Taunton, Attleboro, New Bedford, and several towns; 10 billion gallons was diverted for agriculture; and about 2 billion gallons was used by industry. Approximately 7 billion gallons more water was exported from the basin than was imported. Only a small part of the pumpage is consumed within the basin. Most of the pumpage diverted by municipalities and industries eventually returns to the hydrologic system as sewage or industrial effluent and consequently does not contribute substantially to the total draft on the system. Water imported to the basin from North Watuppa Pond and discharged to the Fall River sewer plant, outside the basin, is not included in the foregoing figures.

Of the total area mantled by unconsolidated deposits, approximately 25 square miles, including 90 different locations, is known to be underlain by permeable material that is capable of yielding 300 gpm or more to a single well. Ground water in some of the 90 areas cannot be used, however, because of urbanization, proximity of potential sources of pollution, or economic reasons. Many of the 90 high-yielding parts of the principal aquifer system are located in thick, permeable stratified glacial drift which fills depressions in the underlying surface of till and bedrock. Many of these depressions, which are formed in valleys of the pre-glacial drainage system, have little similarity to the patterns of present-day drainage systems. The unconsolidated deposits that fill these depressions are the major sources of the 3.1 billion gallons of ground water pumped in 1967 by 21 cities, towns, and water districts, and for the 1.2 billion gallons pumped by industrial, institutional, domestic, and agricultural wells. The net amount of ground water brought into the basin by municipalities in 1967 was about 0.15 billion gallons. Many domestic and industrial wells finished in bedrock produced about 0.2 billion gallons during 1967.

The water pumped from streams, reservoirs, and wells is generally soft, acid to slightly acid, and low in dissolved solids. Although the water meets standards for potable water in most respects, the concentration of iron and manganese and color commonly exceed the limits recommended by U.S. Public Health Service (1962). Consequently, most streams require treatment before being acceptable as a public supply. Sediment and turbidity are low in most streams, except for brief periods during high flows.

Ground water in the stratified drift commonly is corrosive and locally exceeds the limits for iron and manganese in public water supplies as recommended by U.S. Public Health Service. Water from wells in bedrock commonly contains an abundance of iron. Ground water is used without treatment in some municipal systems; however, in many locations the water is chlorinated or treated by other methods to correct for pH or to remove iron and manganese.

The temperature of ground water ranges, normally, from 7° to 12°C (45° to 54°F) and averages about 11°C (52°F). The chloride content in ground and surface water reportedly has increased since the first observations in 1890, presumably because of the increase in effluent from dumps, sewage, and other wastes, and from drainage of heavily salted highways and streets.

This study includes a period of drought as well as record high flows. It should be useful in planning expansion of existing water systems, planning regional systems or combinations of existing systems, locating water supplies for industrial development, and planning sites for waste disposal that will have minimal effect on potential water sources.

WATER USE

Of the 182.4 billion gallons of water pumped in 1967, 84 percent was fresh and salt water used for cooling by electric utilities on the Matfield and lower Taunton Rivers; the remaining 16 percent was pumped by municipal systems, agriculture (principally the cranberry industry), industrial and commercial establishments, institutions, and residences, as shown on the accompanying diagrams (figs. 7 and 8). In 1967 about one quarter of the water pumped, exclusive of that used by electric utilities, was diverted from the basin. Data are not available on the amount of water consumed and lost to the hydrologic system; almost all water is returned to the ground or to the streams in one way or another.

During years of below-average precipitation, pumpage is generally greater than in years of above-average precipitation. The 1963-67 drought not only brought greater pumpage but additional surface-water diversions to relieve shortages in municipal reservoirs. Silver Lake, supplying Brockton, Hanson, and Whitman, reached dangerously low levels during the drought. By statute, diversion was authorized for and the necessary works were completed to permit flow of water from Furnace and Oldham Ponds (outside the basin) and Monponsett Pond (within the basin) to Silver Lake. Diversions are authorized only during the winter months and are limited to water in these ponds that exceeds an elevation of 56 feet above sea level. In 1967 when rainfall raised these ponds to a level over that fixed by statute, large diversions were made to Silver Lake to restore it to full pond. Diversion from Monponsett Pond in that year was 1.87 billion gallons, or about 80 percent of the water supplied in a year to the Brockton system (figs. 9 and 10). In 1968, only 376 million gallons was diverted from Monponsett Pond to maintain Silver Lake at capacity. At about this time construction of the Somerset Reservoir (within the basin) eliminated dependence by the Town of Somerset on water from Fall River's North Watuppa Pond, outside the basin (figs. 9 and 10).

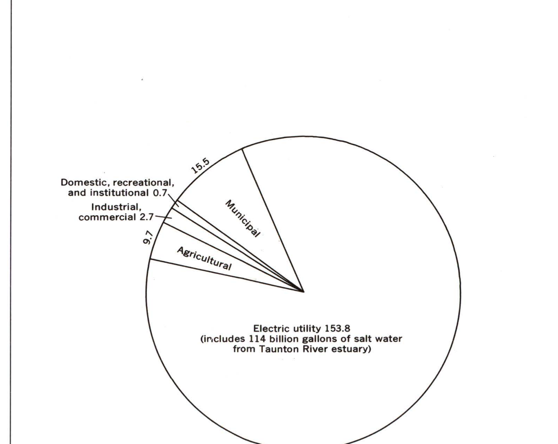

FIGURE 7.—*Water use in 1967, in billions of gallons.*

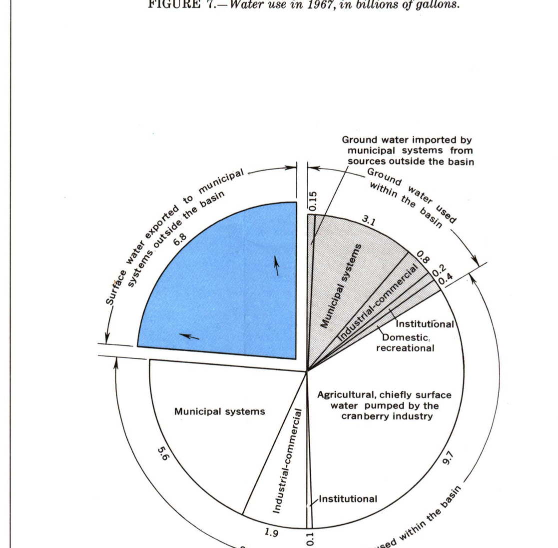

FIGURE 8.—*Water use, exclusive of electric utilities, 1967, in billions of gallons.*

MUNICIPAL WATER SYSTEMS

The sources of water used for municipal supplies and the details of the municipal water systems within the basin are summarized on the map (fig. 10) and table. Small exchanges of water between municipal systems are made for geographic or economic reasons. Emergency connections exist between many adjoining systems, but a basin-wide system to handle major emergencies is lacking. Diversions of water to, from, and within the basin are complicated, as is shown on the map.

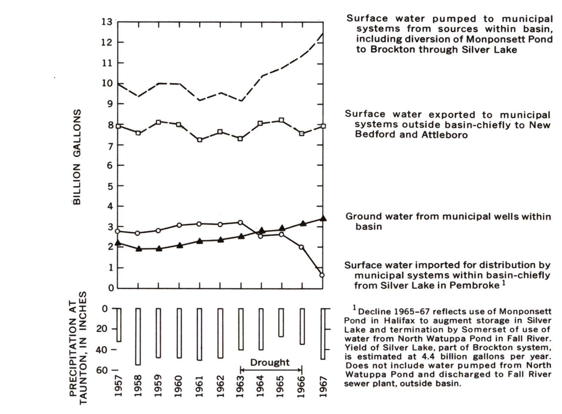

FIGURE 9.—*Trends in municipal pumping, 1957-67.*

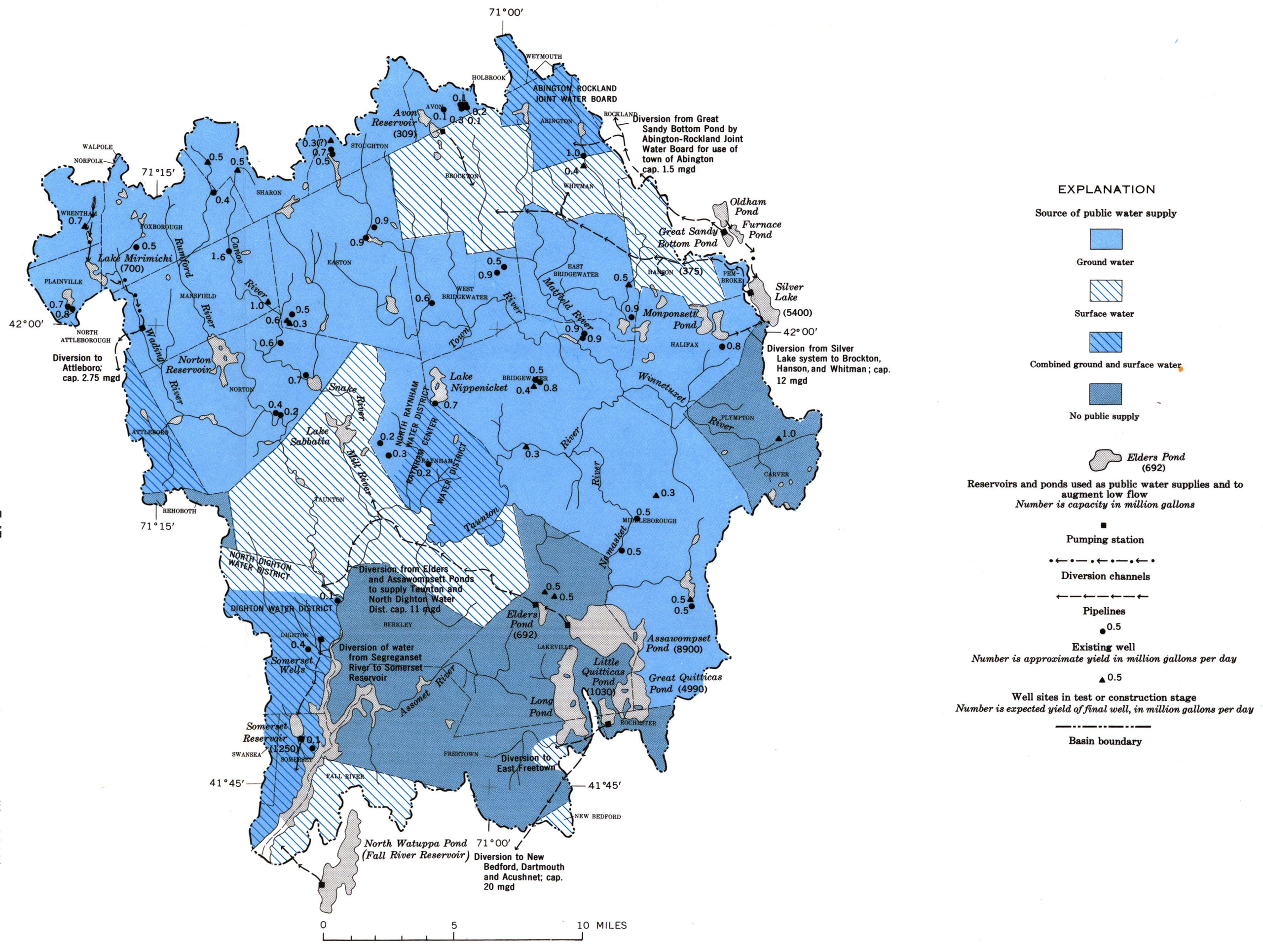

FIGURE 10.—*Municipal water systems, location of reservoirs, wells, and diversions for municipal purposes.*

TABLE 1.—*Municipal water systems, 1967*[1]

City, town, or water district	System capacity[2] (mgd)	Maximum day (mgd)	Water pumped 1967 (mg)	Capacity of wells and reservoirs in the Taunton River basin (mgd): Surface water	Ground water	Water pumped from sources in Taunton River basin (mg) in 1967: Surface water	Ground water	Remarks and notes
Abington-Rockland Joint Water Board	4.3	3.0	794	0	1.0	0	291	About 45 percent of 385 mg pumped from Great Sandy Bottom Pond supplied to Abington.
Attleboro	9.1	8.9	2,476	2.75	0	605	0	
Avon	.6	.65	132	0	.6	0	132	
Berkley	--	--	--	--	--	--	--	No public supply. Towns wells supply municipal buildings.
Bridgewater	2.3	e1.0	257	0	2.3	0	257	Reserve capacity about 0.9 mgd.
Brockton	13.5	--	3,019	1.5	0	646	0	Pumped 646 mg from Avon Reservoir, 2,373 mg from Silver Lake, which received 1,873 mg diverted from Monponsett Pond and 679 mg from Oldham Pond.
Carver	--	--	--	--	--	--	--	No public supply.
Dighton Water District	.6	--	112	0	.15	e42 (Taunton)	e50	Additional well installed 1967 outside basin; approximately 1 mg per month supplied by Taunton.
East Bridgewater	.9	e.8	182	0	.9	0	182	
Easton	2.2	1.3	323	0	2.2	0	323	
Fall River	e10.0	15.0	e3,820	0	0	0	0	Supply obtained from and discharged to points outside basin; not included in basin totals for water use. Not including South Watuppa Pong industrial supply.
Foxborough	e3.5	2.7	586	0	.9	0	0	Yield of South St. wells 0.47 mgd and Oak St. wells about 0.43 mgd during low water.
Freetown	--	--	--	--	--	--	--	No public supply. Part of East Freetown supplied from New Bedford transmission line.
Halifax	.8	e.4	62	0	.8	0	62	
Hanson	--	--	151	0	0	0	0	Supplied by Brockton from Silver Lake line.
Holbrook	--	--	--	--	--	--	--	Supplied by sources outside basin.
Lakeville	--	--	--	--	--	--	--	No public supply.
Mansfield	2.8	2.7	578	0	1.6	0	e350	System capacity is that of Cate Spring area and one area in Ten Mile River basin; other station in Ten Mile River basin has nominal capacity.
Middleborough	1.5	1.3	273	0	1.5	0	273	Additional 0.5 mgd well under construction.
New Bedford	20.5	25.0	6,727	20.5	0	6,727	0	Capacity is city's share of safe yield of Lakeville Ponds.
Norfolk	.14	--	--	--	--	--	--	Supplied by sources outside basin.
North Attleborough	4.3	3.0	758	0	0	0	0	Supplied by sources outside basin.
North Dighton Water District	--	--	60	--	--	--	--	Supplied by Taunton.
North Raynham Water District	.5	.2	e36	0	.5	0	36	
Norton	1.7	1.2	214	0	1.7	0	214	
Pembroke	--	--	--	--	--	--	--	Supplied by source outside basin.
Plainville	1.5	e.6	145	0	1.5	0	145	
Plympton	--	--	--	--	--	--	--	No public supply.
Raynham Center Water District	.9	.24	72	0	.9	9.5 (Taunton)	72	
Rehoboth	--	--	--	--	--	--	--	No public supply.
Rochester	--	--	--	--	--	--	--	No public supply.
Rockland	--	--	--	--	--	--	--	See Abington-Rockland Joint Water Board.
Sharon	4.1	2.3	316	0	0	0	0	Supplied by sources outside basin. Safe yield 3.3 to 3.9 mgd. Purchased 4.5 mg from Foxborough.
Somerset	5.5	2.0	439	5.0	.5	325	114	Filtration plant completed 1968.
Stoughton	2.8	2.8	718	0	1.2	0	405	
Swansea	2.3	1.75	250	0	0	0	0	Supplied by sources outside basin.
Taunton	11.0	7.5	2,059	11.0	0	2,059	0	
Walpole	--	--	--	--	--	--	--	Supplied by sources outside basin.
West Bridgewater	2.0	.6	151	0	2.0	0	151	
Weymouth	--	--	1,215	--	--	--	--	Supplied by sources outside basin.
Whitman	--	e1.3	215	0	0	0	0	Supplied by Brockton from Silver Lake line. Well, capacity 0.4 mgd, in reserve.
Wrentham	1.6	1.0	227	0	0	0	0	Supplied by sources outside basin.

1/ Information from Massachusetts Department of Public Health, town and city officials, water district officials, reports of consulting engineers for municipalities and regional planning districts.

2/ System capacity in some municipalities refers to safe yield of individual sources of supply; in others refers to yield of system, considering size of mains and capacity of pumping equipment.

e Estimated figure, used where other data not available.

PRECIPITATION

Availability of water depends on precipitation. Average annual precipitation is between 42.6 and 46.8 inches over the basin (fig. 2) and precipitation during the year is fairly uniform (fig. 3). The prolonged drought of 1963 to 1967 significantly reduced the amount of usable water. The drought was probably the most severe for the period of precipitation record extending back to the 19th century at many points in the basin (fig. 4). The drought began with 2 years of near-normal to slightly deficient precipitation, followed, in 1965, by a deficiency ranging from 16.7 to 19.8 inches. In 1966 the precipitation deficiency at the meteorological stations was between 5.1 and 9.2 inches. Above-normal precipitation in 1967 ended the drought.

During the first 2 years of the drought, streamflow was only slightly less than the long-term average (fig. 5). Major streamflow deficiency began in late spring or early summer of 1964 and continued to early spring of 1967. In 1965 and 1966 streamflow was only 50 percent of the long-term average.

Ground-water level in most wells reached its low at the end of 1965 and recovered only slightly during 1966 (fig. 6). Water level returned to the normal range in 1967.

As a result of the reduction in ground- and surface-water storage, public and private water supplies were endangered. Almost all communities restricted the use of water, and many accelerated construction of additional permanent water-supply facilities and initiated temporary measures to ease the effects of the drought. Farmers were seriously affected, especially growers who depend on supplies of surface or ground water for irrigation or for flooding their cranberry bogs.

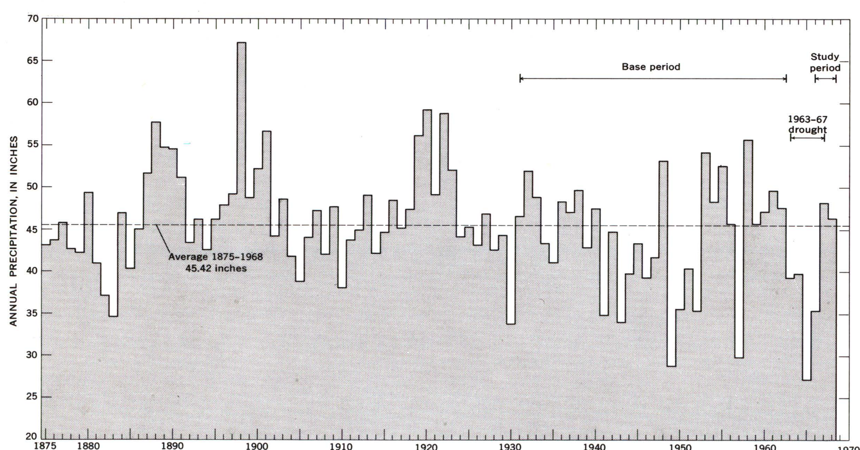

FIGURE 4.—*Annual precipitation at Taunton.*

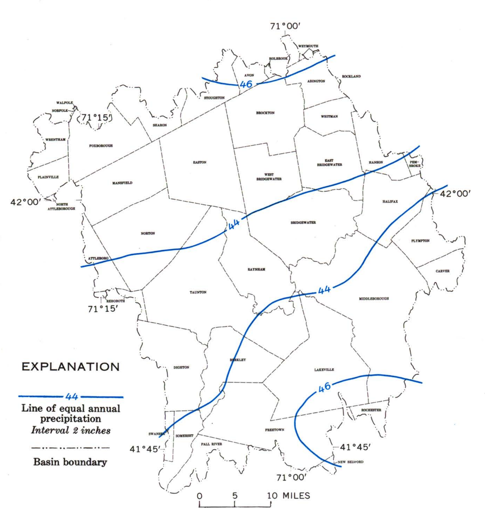

FIGURE 2.—*Average annual precipitation, 1931-65.*

Month	Minimum monthly precipitation, in inches and year of occurrence	Year	Average monthly precipitation, in inches	Maximum monthly precipitation, in inches and year of occurrence	Year
Jan	0.68	1955	3.66	8.35	1958
Feb	.84	1947	3.53	5.89	1960
Mar	1.12	1949	3.40	7.18	1942
Apr	.85	1942	3.91	7.86	1958
May	.35	1964	3.38	10.39	1948
June	.05	1949	3.16	8.89	1938
July	.12	1952	3.35	5.88	1938
Aug	.67	1940	4.24	15.78	1955
Sept	.02	1941	3.84	11.63	1933
Oct	.60	1946	3.55	8.49	1955
Nov	1.01	1932	4.22	8.11	1941
Dec	.62	1955	3.49	8.96	1937

Minimum yearly precipitation: 27.31 inches (1965)
Maximum yearly precipitation: 56.57 inches (1933)
Average yearly precipitation: 43.52 inches

FIGURE 3.—*Average monthly precipitation at Taunton, 1931-65.*

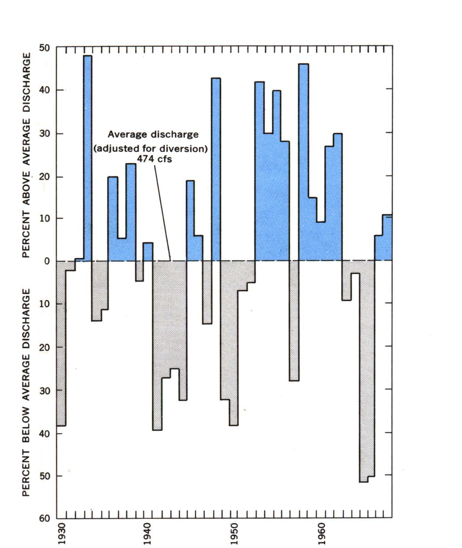

FIGURE 5.—*Deviation of annual discharge from average discharge, Taunton River at State Farm.*

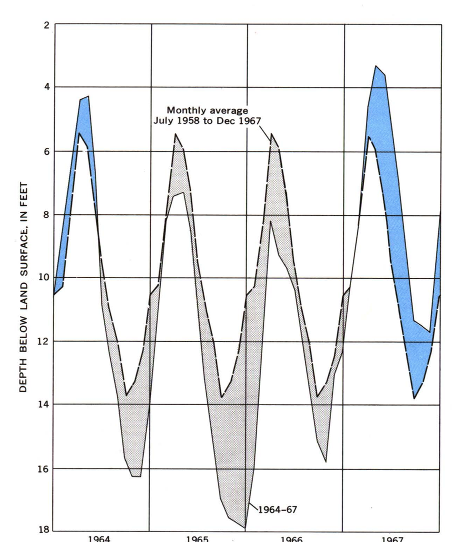

FIGURE 6.—*Hydrograph of well East Bridgewater W30 comparing 1964-67 ground water level with 1958-67 average.*

SURFACE WATER

INTRODUCTION

Surface water is the largest potential water resource of the basin. The basin includes at least 50 square miles of swamps which act as natural flood detention reservoirs and about 23 square miles of lakes and ponds, of which more than 50 are great ponds, having an area of at least 10 acres. The largest are the Lakeville Ponds which supply water to New Bedford and Taunton. The Taunton River and most of its tributaries are large undeveloped sources of water which would require upgrading in quality and treatment for use in public water systems. For example, engineers[1] estimate that a reservoir in the estuary between Somerset and Freetown might furnish 80 million gallons per day.

For the present study, streamflow measurements were made at three long-term and four short-term (less than 5 years of record) gaging stations and at 33 low-flow partial-record sites on the Taunton River and its tributaries. A base period of 35 years 1931-65, was used for purposes of data comparison and correlation. Unless otherwise noted, all data are compiled by water year, the 12-month period October 1 through September 30.

[1]Camp, Dresser, and McKee, Engineers, 1965, Report on water resources of Bristol and Plymouth Counties: Unpub. report to Commonwealth of Massachusetts, Boston, 14 p.

AVERAGE DISCHARGE

The average annual (1931-65) precipitation of 44 inches over the basin amounts to about 400 billion gallons. Of this amount nearly 25 inches, or about 230 billion gallons, is discharged from the basin each year by the Taunton River. Monthly average discharge (fig. 11) is least during the growing season from May to October and increases during the fall and winter, reaching a peak in March. Annual discharge (fig. 12) varied from 10.37 inches in 1966 to 37.43 inches in 1956.

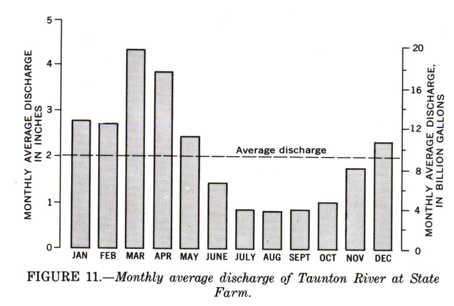

FIGURE 11.—*Monthly average discharge of Taunton River at State Farm.*

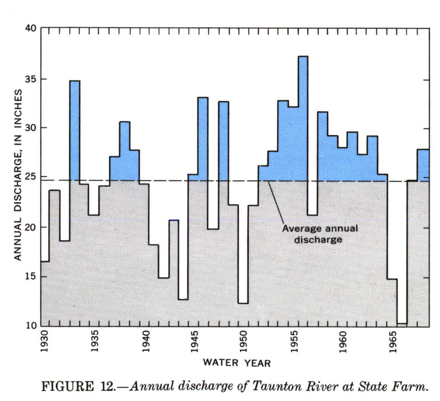

FIGURE 12.—*Annual discharge of Taunton River at State Farm.*

FLOW DURATION

The shape of the flow-duration curve provides a means of comparing the flow characteristics of one stream with another and is useful in making inferences about the geohydrology of the drainage basin upstream from the gaging site. For example, a gently sloping curve (Fall Brook near Middleborough) (fig. 13) shows that water stored in ponds, swamps and reservoirs or in ground-water aquifers tends to equalize streamflow. A steeply sloping curve (Dorchester Brook near Brockton) shows that more of the streamflow is direct runoff and that less storage is available. The curves can also be used to predict probable distribution of future flows, provided that drainage characteristics do not differ from those prevailing during the period on which the curve is based.

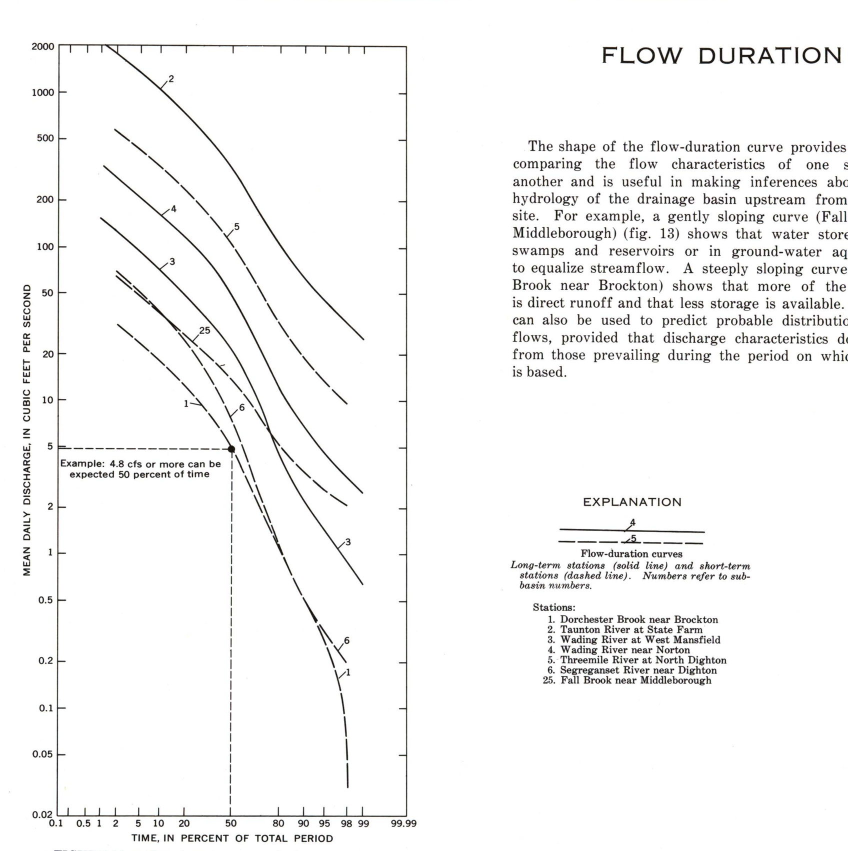

FIGURE 13.—*Flow-duration curves for base period 1931-65.*

FLOOD FLOWS

Information such as magnitude and frequency of floods is essential to proper design of flood-control structures, bridges, and culverts. Floods have never been a major problem along the Taunton River, but occasional damaging floods occur on small tributaries that have a steep gradient and low storage capacity. Data on the magnitude and frequency of flood flows at selected sites is shown on the map (fig. 14). The flood-stage data shown may be used with a topographic map to determine areas subject to flooding near the gaging stations.

Because flood-fow data obtained from a gaging-station record apply only to the site of the station, a method (Knox and Johnson, 1965) for calculating probable flood magnitudes at ungaged sites in subbasins with areas larger than 10 square miles is given below:

Equation: $Q_{2.33} = 3.19\ AS^{0.5}$ $\quad Q_{25} = 9.53\ AS^{0.5}$
$Q_{5} = 4.51\ AS^{0.5}$ $\quad Q_{50} = 12.6\ AS^{0.5}$
$Q_{10} = 6.11\ AS^{0.5}$

Q = magnitude of flow, in cubic feet per second; subscript is the recurrence interval in years.
A = area of drainage basin, in square miles.
S = average stream slope, in feet per mile, between points on the stream that are 10 and 85 percent of the stream length above the site.

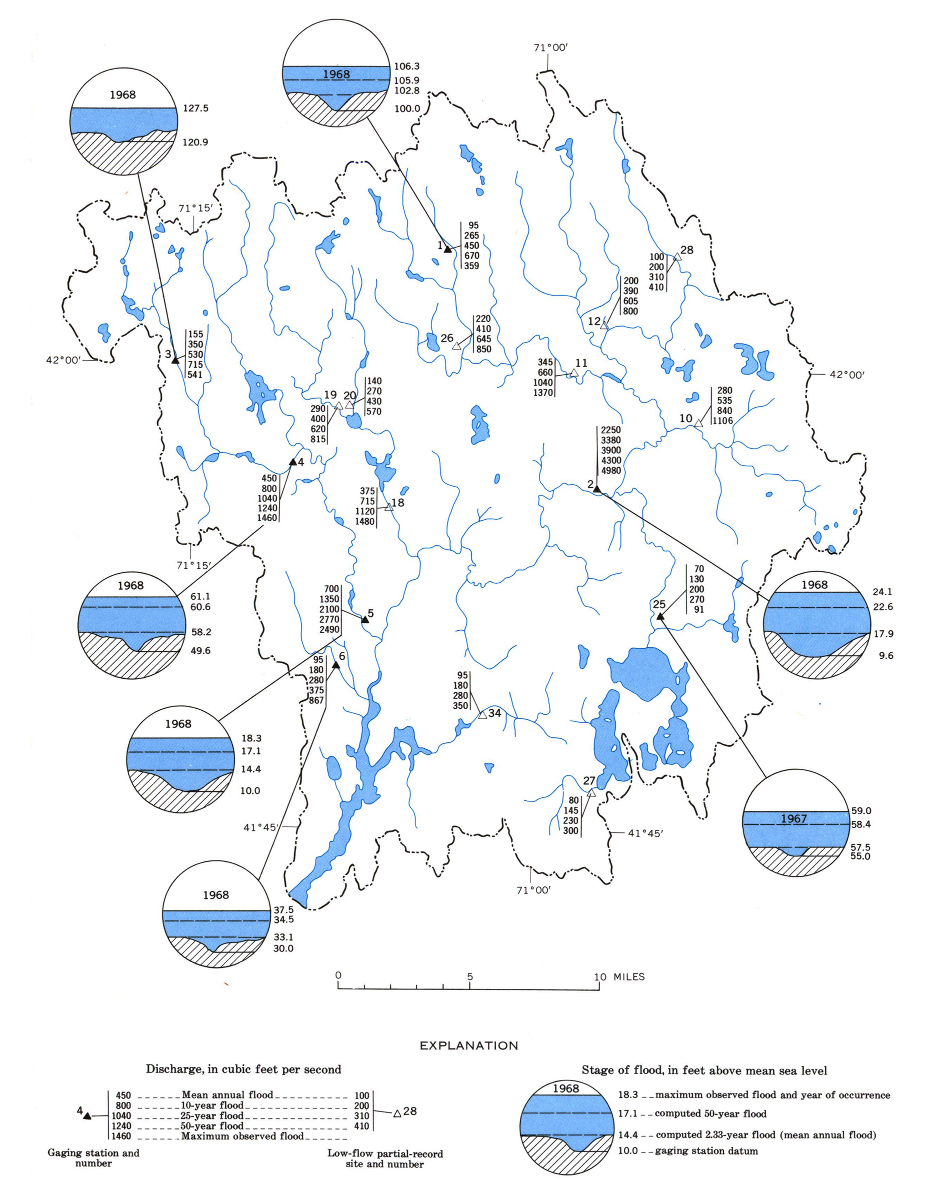

FIGURE 14.—*Magnitude of flood flows and elevations of crests at gaging stations.*

HIGH-FLOW FREQUENCY

The curves on the high-flow frequency graphs (fig. 15) for small numbers of consecutive days show the effect of terrain on high flow from rainstorms or snowmelt. For example, the relatively flat curves (Taunton River) are representative of streams draining basins that have temporary storage in swamps and ponds. The storage delays runoff and lowers the amplitude of the crest by equalizing the flow. Steeper curves (Wading River at West Mansfield) are representative of streams in which high flows are relatively undiminished by basin storage.

LOW-FLOW FREQUENCY

The curves on the low-flow frequency graphs (fig. 16) are based on the climatic year, April 1 to March 31, to avoid placing the low-flow season in 2 separate water years. As on the high-flow frequency curves, the slope of the low-flow frequency curves for small numbers of consecutive days is an indicator of the amount of basin storage that contributes to the streamflow.

FLOW FREQUENCY

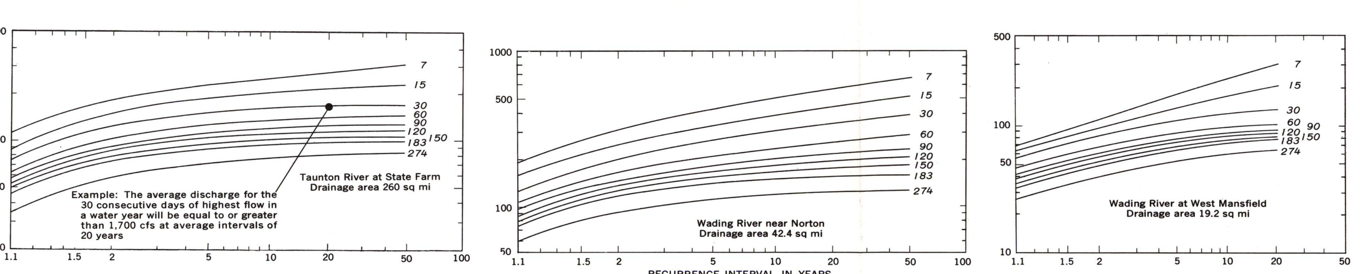

FIGURE 15.—*Frequency curves of highest mean discharge for indicated number of consecutive days.*

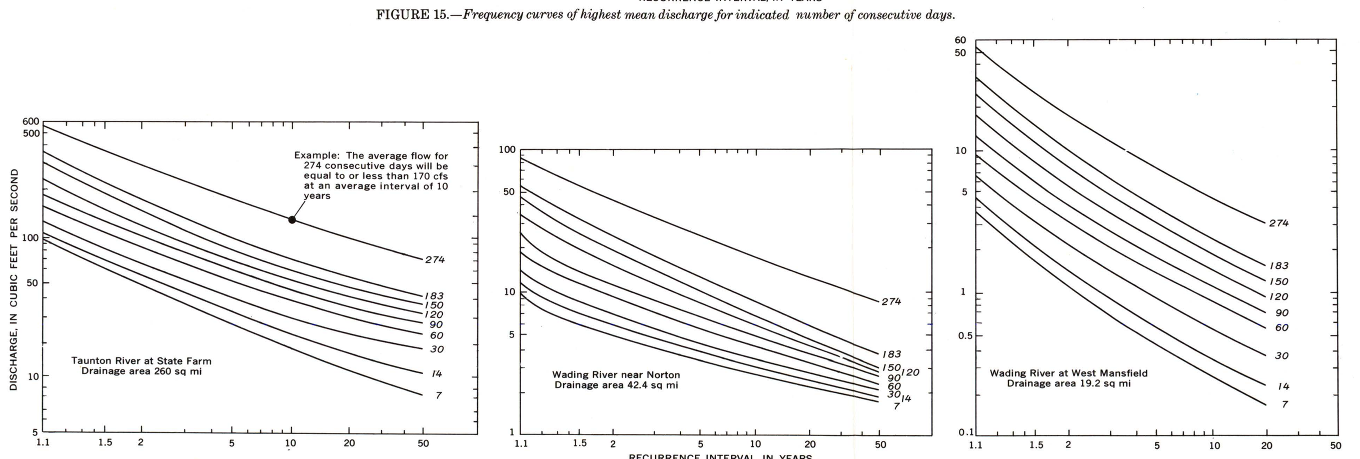

FIGURE 16.—*Frequency curves of lowest mean discharge for indicated number of consecutive days.*

LOW-FLOW ANALYSIS

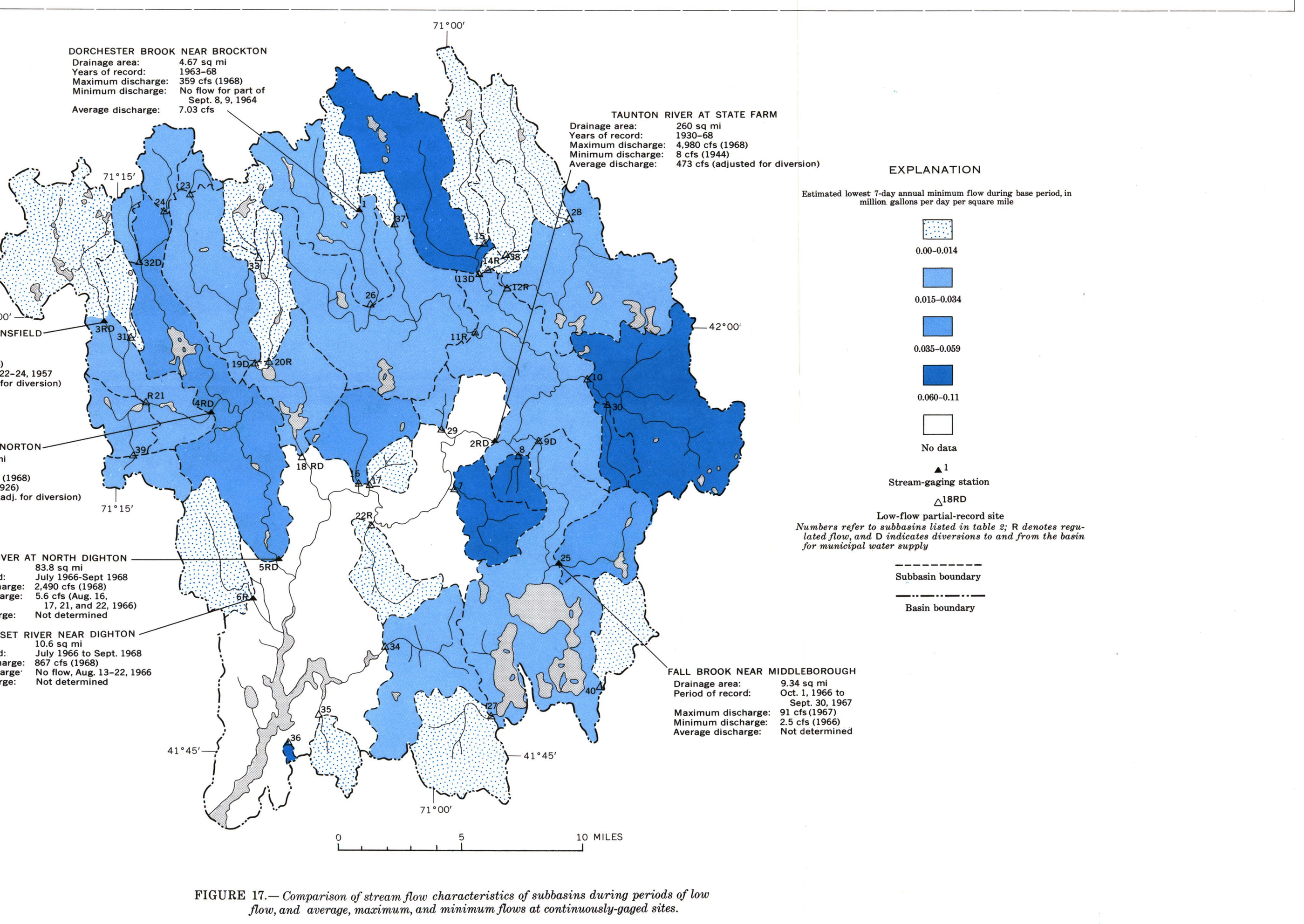

FIGURE 17.—*Comparison of stream flow characteristics of subbasins during periods of low flow, and average, maximum, and minimum flows at continuously-gaged sites.*

TABLE 2.—*Estimated minimum 7-day average flow at 2-year and 10-year recurrence intervals*

Subbasin number (Fig.17)	Name of short-term gaging station or low-flow partial-record site (downstream order)	Drainage area (sq mi)	2-year recurrence interval: cfs	mgd/sq mi	10-year recurrence interval: cfs	mgd/sq mi
15	Beaver Brook near East Bridgewater	9.43	0.77	0.053	0.24	0.017
D 13	Matfield River at East Bridgewater	31.7	10.3	.21	5.1	.104
38	Meadow Brook at Union St. East Bridgewater	6.24	.21	.022	.03	.003
R 14	Meadow Brook at East Bridgewater	7.93	.55	.045	.08	.006
28	Shumatuscacant River near Hanson	11.0	.14	.008	.02	.001
R 12	Satucket River at East Bridgewater	32.2	3.5	.071	1.2	.024
1	Dorchester Brook near Brockton	4.67	.26	.036	.02	.003
26	Hockomock River near West Bridgewater	20.4	2.4	.078	.81	.025
37	West Meadow Brook near Brockton	1.98	.19	.061	.06	.020
R 11	Town River at Bridgewater	55.8	7.2	.082	2.6	.030
30	Raven Brook near Halifax	3.59	1.2	.22	.61	.109
10	Winnetuxet River near Halifax	31.3	14.0	.29	7.5	.153
27	Fall Brook at East Freetown	13.1	1.2	.060	.40	.020
40	Black Brook near North Rochester	7.44	.31	.027	.03	.002
25	Fall Brook near Middleboro	9.34	2.8	.19	1.3	.090
D 9	Nemasket River near Middleboro	67.5	10.0	.096	4.0	.039
8	Purchade Brook near Middleboro	3.12	1.0	.21	.51	.106
29	Snows Brook near North Middleboro	2.71	.45	.11	.17	.041
7	Poquoy Brook near North Middleboro	8.30	2.6	.20	1.2	.094
R 22	Cotley River at East Taunton	7.48	.91	.079	.31	.027
17	Dam Lot Brook near Taunton	2.97	.34	.074	.12	.026
16	Forge River near Taunton	9.19	2.1	.15	.91	.064
23	Canoe River at East Foxboro	1.61	.14	.056	.07	.027
D 19	Canoe River near Norton	18.6	1.9	.065	.82	.028
33	Poquanticut Brook near North Easton	4.48	.28	.040	.15	.022
R 20	Mulberry Meadow Brook near Norton	12.0	1.0	.054	.56	.030
R 18 D	Mill River at Taunton	41.2	4.6	.073	2.6	.041
31	Hodges Brook at West Mansfield	3.72	.07	.012	.03	.005
39	Chartley Brook near Attleboro	1.40	.13	.060	.07	.034
R 21	Chartley Brook at Chartley	6.52	.73	.072	.41	.040
24	Rumford River at East Foxboro	5.09	.57	.073	.32	.041
D 32	Robinson Brook at Mansfield	2.59	.35	.089	.20	.050
R 5 D	Threemile River at North Dighton	83.8	12.6	.10	7.4	.057
R 6	Segreganset River near Dighton	10.6	.32	.020	.02	.001
34	Assonet River near Assonet	16.2	2.3	.093	.88	.035
35	Rattlesnake Brook near Assonet	4.22	.27	.040	.08	.012
36	Taunton River Tributary near Fall River	.25	.07	.19	.04	.092

D Diversions to or from basin. R Regulated flow.

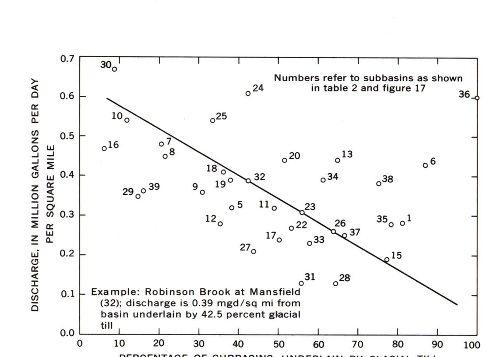

FIGURE 18.—*Relation between estimated median base flow and percentage of each subbasin underlain by glacial till.*

To define low-flow characteristics at the short-term gaging stations and low-flow partial-record sites, discharge records of low flow were correlated with records of concurrent discharge at the long-term stations (table 2). The estimated lowest 7-day minimum low flow for each subbasin (fig. 17 and table 2) during the base period is derived largely from ground water.

Estimated median base flow (2-year recurrence interval) of subbasins decreases as the percentage of drainage area underlain by glacial till increases (fig. 18). The scatter of points is caused by diversions, regulation, and other hydrologic causes, such as flowing artesian aquifers.

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