GAZETTEER OF HYDROLOGIC CHARACTERISTICS OF STREAMS IN MASSACHUSETTS--COASTAL RIVER BASINS OF THE SOUTH SHORE AND BUZZARDS BAY

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U.S. GEOLOGICAL SURVEY

Water -Resources Investigations Report 84-4288

Prepared in cooperation with the

COMMONWEALTH OF MASSACHUSETTS

DEPARTMENT OF ENVIRONMENTAL QUALITY ENGINEERING

DIVISION OF WATER POLLUTION CONTROL

Boston, Massachusetts

1984

UNITED STATES DEPARTMENT OF THE INTERIOR

WILLIAM P. CLARK, Secretary

GEOLOGICAL SURVEY

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CONVERSION FACTORS

The following factors may be used to convert the inch-pound units published herein to the International System of Units (SI).

Multiply inch-pound units	By	To obtain SI Units
	Length	
inch (in)	25.4*	millimeter (mm)
foot (ft)	0.3048	meter (m)
mile (mi)	1.609	kilometer (km)
	Area	
square mile (mi^2)	2.590	square kilometer (km^2)
	Flow	
cubic foot per second (ft^3/s)	0.02832	cubic meter per second (m^3/s)
cubic foot per second per square mile [$(ft^3/s)/mi^2$]	0.01093	cubic meter per second per square kilometer [$(m^3/s)/km^2$]
	Slope	
foot per mile (ft/mi)	0.1894	meter per kilometer (m/km)

Temperature

Temperature in degrees Fahrenheit (^oF) can be converted to degrees Celsius (^oC) as follows:

$$^oC = 5/9\ (^oF-32).$$

*Exact.

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ABSTRACT

The coastal river basins include the minor river basins draining into Massachusetts Bay along the South Shore or into Buzzards Bay. The larger of these basins are the North, South, Jones, Wareham, Weweantic, Mattapoisett, Acushnet, and Slocums River basins. Drainage areas, using the latest available 1:24,000 scale topographic maps, were computed for the first time for ungaged streams draining more than 3 square miles and were re-computed for data-collection sites.

Statistics on streamflow characteristics computed with a new data base are presented for six gaged streams. Daily flow records through 1982 were used to compute annual and monthly flow statistics, duration of daily flow values, and the annual 7-day mean low flow at the 2-year and 10-year recurrence intervals. Seven-day low-flow statistics are presented for 49 partial-record sites, and the procedures used to determine the hydrologic characteristics of the basin are summarized. This gazetteer will aid in the planning and siting of water-resources related activities and will provide a common data base for governmental agencies and the engineering and planning communities.

INTRODUCTION

Information on hydrologic characteristics, including drainage areas, frequency of low flows, and duration of daily flows, is necessary to plan and manage water-resources related activities. Governmental agencies and the engineering and planning community need streamflow characteristics to satisfy requirements relative to fisheries management, hydropower, land-use planning, stream-systems analysis, waste assimilation, and water-resources development and management. No current hydrologic data base containing a comprehensive list of drainage areas, monthly flows, low-flow frequencies, and duration of daily flows is available for most of the Massachusetts stream systems. Drainage areas are available for selected sites where streamflow data are collected. Streamflow characteristics are presented in various reports, but these data, to be current, need to be re-analyzed using the latest available daily flow records.

In response to this need, a study was begun in 1980, in cooperation with the Massachusetts Division of Water Pollution Control, to analyze available streamflow and river-basin characteristics, and to compute subbasin drainage areas. This report is part of a series of gazetteers on the hydrologic characteristics of the major river basins in the State. Gazetteers are also available for the coastal river basins of the North Shore and Massachusetts Bay (Wandle, 1984a), Connecticut River basin (Wandle, 1984b), Hudson River basin (Wandle, 1984c), Merrimack River basin (Wandle and Fontaine, 1984), Taunton and Ten Mile River basins (Wandle and Keezer, 1984), Thames River basin (Wandle and LeBlanc, 1984), Housatonic River basin (Wandle and Lippert, 1984), Blackstone River basin (Wandle and Phipps, 1984). This report provides the first detailed listing of drainage areas and streamflow characteristics derived from daily flow records in the coastal drainage basins of the South Shore and Buzzards Bay. These streamflow characteristics are an expansion and an update of those given in Williams and Tasker (1974a, 1974b). Low-flow estimates are compiled for the low-flow sites in Williams and Tasker (1974a, 1974b, 1978) except for the Mattapoisett River sites where the values are from Olimpio and de Lima (1984).

The coastal river basins in southeastern Massachusetts (fig. 1) include the several minor river basins draining into Massachusetts Bay or Buzzards Bay. The North, South, Jones, Wareham, Weweantic, Mattapoisett, Acushnet, and Slocums River basins are the larger of these basins. All or part of the following communities are included in the study area: Abington, Acushnet, Bourne, Carver, Cohasset, Dartmouth, Duxbury, Fairhaven, Freetown, Halifax, Hanover, Hanson, Hingham, Kingston, Lakeville, Marion, Marshfield, Mattapoisett, Middleborough, New Bedford, Norwell, Pembroke, Plymouth, Plympton, Rochester, Rockland, Sandwich, Scituate, Wareham, Westport, Weymouth, and Whitman.

Streamflow characteristics presented for the six continuously gaged streams are based upon a new sample of daily flow records in comparison to flow records used in Higgins (1967), Knox and Soule (1949), Male and Ogawa (1982), and Williams and Tasker (1974a, 1974b). Streamflow records through the 1982 water year were available for this analysis. For each site, records were selected to represent a flow regime influenced by fairly constant river basin conditions (Wandle, 1983).

Drainage areas were re-computed for data-collection sites and computed for the first time for ungaged streams draining greater than 3 mi^2. Drainage divides, as delineated on the latest available 1:24,000 scale topographic quadrangle maps (Brackley and Wandle, 1983); (Wandle and Frimpter, 1982), were used to calculate drainage areas. Drainage areas, for the gaging stations, in earlier reports were computed using the drainage divides as outlined on 1:31,680 or 1:24,000 scale topographic quadrangle maps.

Streamflow data used in this study are a part of the historic streamflow data collected under agreements with State and Federal agencies and the U.S. Geological Survey. Most of the low-flow discharge measurements used in determining low-flow estimates at partial-record sites were collected during the water-resources investigations of the coastal drainage basins of southeastern Massachusetts (Williams and Tasker, 1974a, 1974b, 1978). The array of basin characteristics was created during an evaluation of available streamflow data in central New England (Johnson, 1970). This file is an expansion of the characteristics abstracted by Langbein and others (1947), and by Benson (1962). Basin characteristics were updated and additional characteristics were entered as part of a study to define floodflow characteristics of small streams (Johnson and Tasker, 1974, and Wandle, 1982). The hierarchical stream list was compiled by the Massachusetts Divisions of Water Pollution Control and Fisheries and Wildlife (Halliwell and others, 1982).

Data tabulated include drainage areas, basin and streamflow characteristics for gaging stations, including annual and monthly flow statistics, duration of daily flow values, and the annual 7-day mean low flow at the 2-year and 10-year recurrence intervals. Seven-day low-flow statistics for partial-record sites are also presented. An explanation of the procedures to determine the streamflow and basin characteristics is provided.

The authors thank the many persons who have kindly given time, information, and guidance during this study. Particular thanks are given to persons in the Geological Survey who assisted in the data collection, in the computation of the drainage areas, and in the preparation of this report.

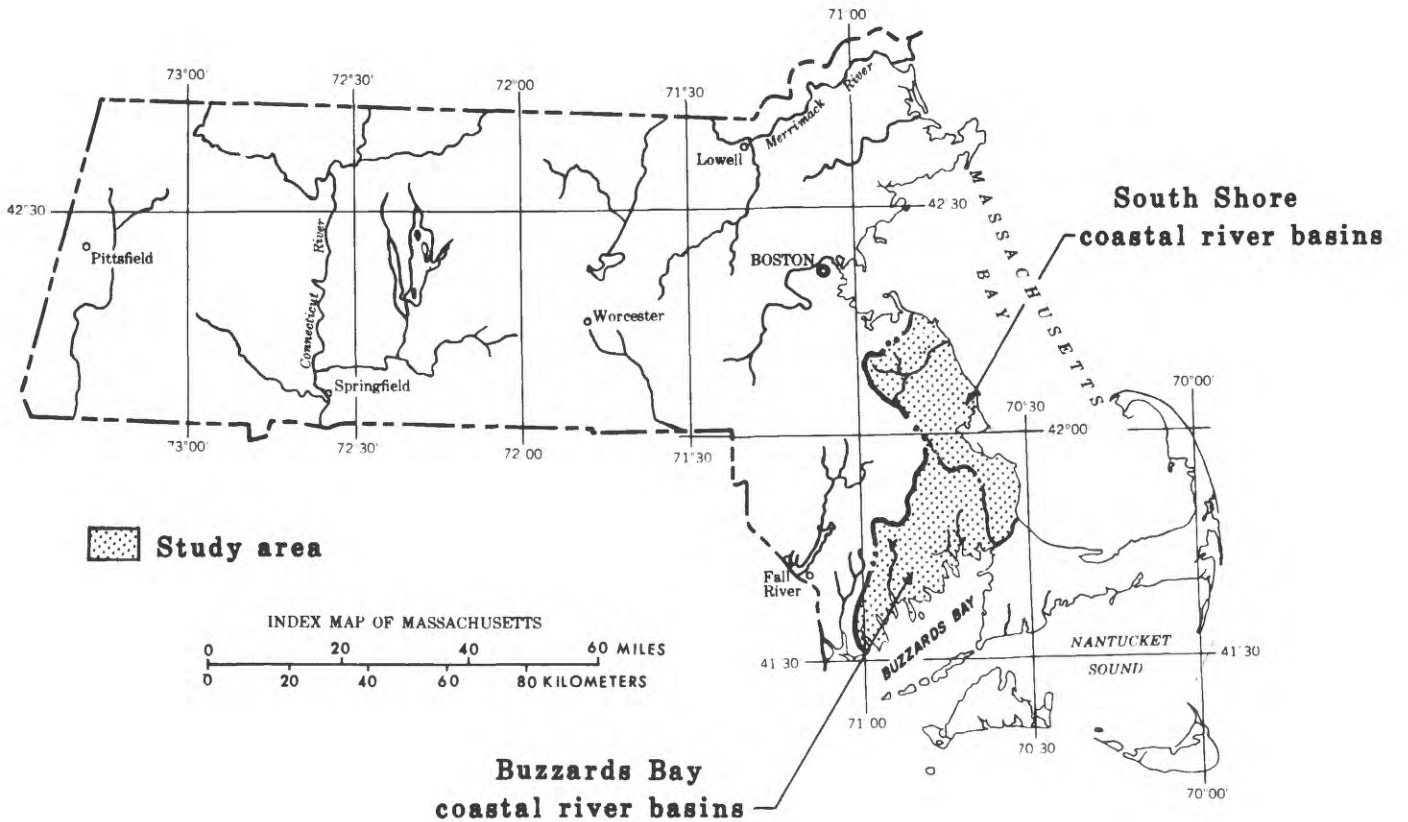

Figure 1.--Location of the coastal river basins of the South Shore and Buzzards Bay

HYDROLOGIC DATA

Hydrologic characteristics are represented by various physical, climatic, and streamflow indices of a river basin. These characteristics can be determined either from available maps by following standardized procedures or from historic streamflow records.

Basin characteristics are indices of the physiography of the basin or of the climate prevailing over the basin and are measured on topographic quadrangle or climatic maps. Streamflow characteristics are computed from continuous records of daily flow or from a set of measurements during the occurrence of a specific event. Streamflow and basin characteristics are used in modeling stream quality, assessing water-resources conditions, analyzing impact of man's activities, and defining relationships to estimate flows or stream-quality parameters at ungaged sites.

Basin Characteristics

Drainage area is one of the most important variables in any hydrologic investigation or in the design of riverine structures because it is the most significant variable in the northeast that influences all streamflow, except perhaps low flow in some regions. The physical boundary for many water-related studies corresponds to the limits for the drainage area upstream from the site.

For this study, drainage areas listed in table 1 (at the end of the report) were determined for the following sites:

1. Survey data-collection sites shown in figures 2 and 3. These sites include continuous-record gaging stations given in table 2 (at the end of the report), low-flow partial-record stations, miscellaneous sites, and water-quality stations.

2. Locations where the drainage area is greater than 3 mi^2.

3. Successive sites along a stream where the area between sites is at least 6 mi^2 on tributary streams and 10 mi^2 on the main river.

The drainage basin divides for these sites were delineated on the latest available 1:24,000 scale topographic quadrangle maps. Subbasin drainage divides are shown in the series of statewide reports, "Drainage Divides, Massachusetts." The coastal river basins of the South Shore and Buzzards Bay are covered by two reports in this series--Ipswich and lower Merrimack River basins and northeast coastal basins (Brackley and Wandle, 1983) and Taunton River basin and southeast coastal basins (Wandle and Frimpter, 1982).

The subbasin drainage areas given in table 1 are indexed to the Massachusetts stream inventory prepared by the Massachusetts Division of Water Pollution Control and the Massachusetts Division of Fisheries and Wildlife (Halliwell and others, 1982) with some modification. Drainage areas were computed for sites meeting one of the three criteria mentioned above. The entire stream listing is included as a reference for stream order. This hierarchical listing begins at the mouth of a major stream and proceeds upstream with tributary streams indented under the main-stem stream. This order is followed to list all the named streams. Unnamed tributaries are included to maintain the hierarchy. The reader is referred to the inventory of rivers and streams report by Halliwell and others (1982) for a more detailed explanation.

The basin characteristics listed below are included because they represent indices that would remain reasonably stable over a planning period. They are useful in predictive surface-water models to assess impacts of proposed developments. The usefulness of these characteristics to explain the variability of various streamflow events has been demonstrated in hydrologic analyses (Thomas and Benson, 1970) and they can be measured readily from available maps. The selected basin indices given in table 3 (at the end of the report) were computed according to the procedures described below. The indices for elevation, storage, lake area, and forest can be computed by the grid method which is explained after all the procedures are described.

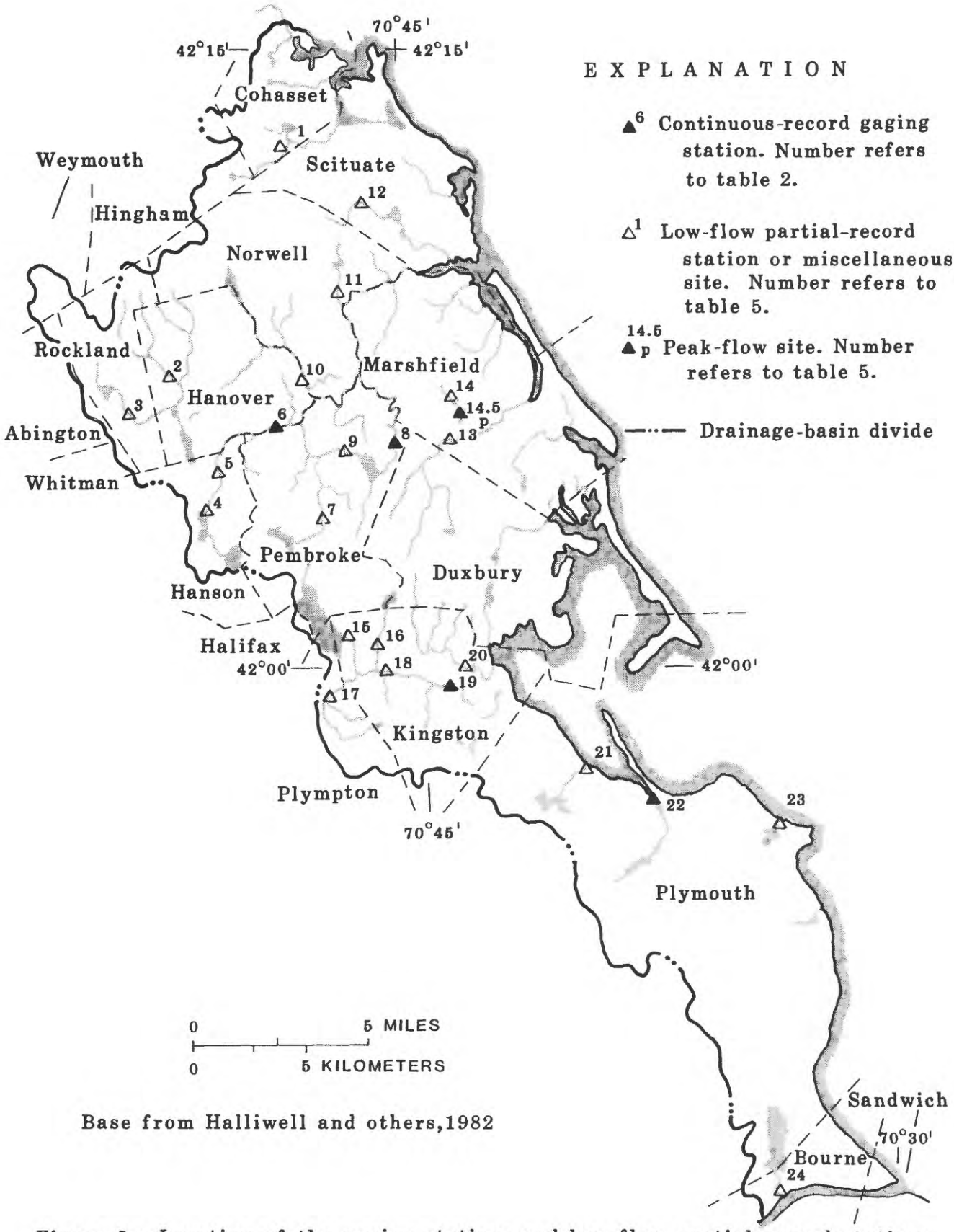

Figure 2.--Location of the gaging stations and low-flow partial-record stations and miscellaneous sites in the coastal river basins of the South Shore

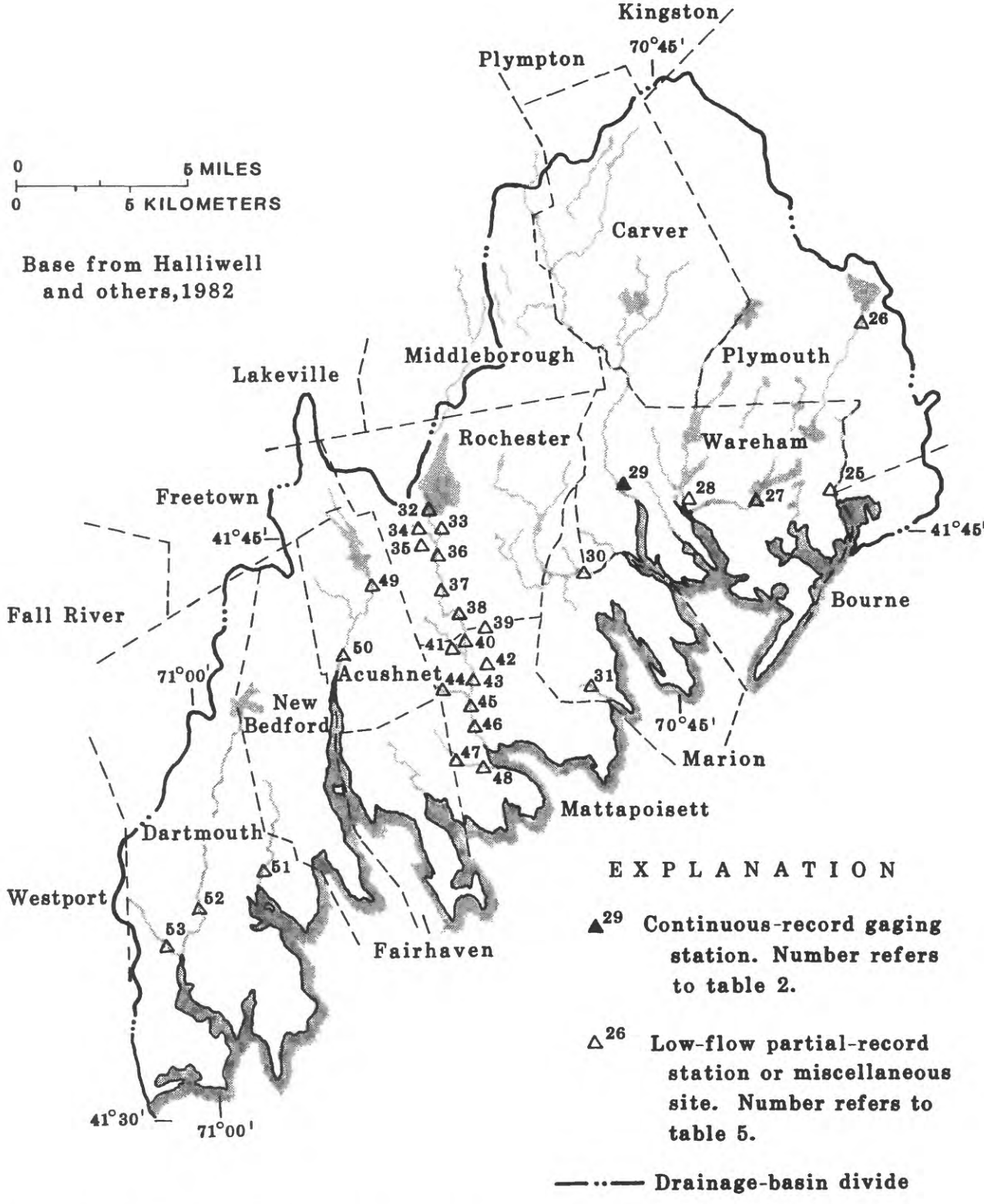

Figure 3.--Location of the gaging stations and low-flow partial-record stations and miscellaneous sites in the coastal river basins of Buzzards Bay

1. Drainage area—Area, in square miles, as measured on the most recent 1:24,000 scale topographic quadrangle maps. Drainage area, as defined in the "National Handbook of Recommended Methods for Water-Data Acquisition" (U.S. Geological Survey, 1977), is "...the area of a river basin, measured in a horizontal plane, that is enclosed by a topographic divide such that direct surface runoff from precipitation normally would drain by gravity into the river basin.". Drainage area boundary lines are traced on topographic maps along divides indicated by contour elevations, starting at the point on the stream for which the drainage area is desired. These lines are drawn to cross a contour at right angles. Interpolation between contours may be indicated by reference to trails, old roads, or firebreaks in forested areas, all of which frequently follow drainage divides. Detailed information may also be obtained from highway or street profiles, from examination of aerial photographs, and from ground reconnaissance. Subareas within each quadrangle map were computed with an electronic digitizer using the procedures of the U.S. Federal Inter-Agency River Basin Committee (1951) as a guide. The coefficients to compute square miles from digitizer units were calculated using the known area of each 7.5-minute quadrangle or of the appropriate 2.5-minute quadrilaterals. Drainage areas for the subbasins were computed by summing the contributing areas.
2. Slope—Main-channel slope, in feet per mile, determined from elevations at points 10 percent and 85 percent of the distance along the main channel from the gaging station to the basin divide.
3. Length—Main-channel length, in miles, from the gaging station to the basin divide, as measured with dividers set to 0.1 mile or with a map measurer.
4. Elevation—Mean basin elevation, in feet above sea level, measured on topographic maps by laying a grid over the map.
5. Storage—Area of lakes, ponds, and marshes, in percent of total drainage area, measured by planimetering or by using a transparent grid. The marsh area includes the area of wooded marshes and marshes as defined by the appropriate topographic quadrangle map symbol. Storage area is the total area of all the lakes, ponds, and marshes expressed as a percentage of the total drainage area.
6. Lake area—Area of lakes and ponds, in percent of the drainage area, determined by the grid method.
7. Forest—Area of forest, in percentage of the drainage area, determined from the forest cover as shown on the topographic map with the green woodland overprint using the grid method.
8. Soil—Soil index, in inches, represents the value of potential maximum infiltration, during an annual flood, under average soil-moisture conditions. This characteristic, provided by the U.S. Soil Conservation Service (Dr. Benjamin Isgur, written commun., 1970), is a function of the soil and cover conditions in the basin. The index was computed from the runoff curve number following procedures in U.S. Department of Agriculture (1972).
9. Latitude—Latitude of stream-gaging station, in decimal degrees, determined by manual measurement.
10. Longitude—Longitude of stream-gaging station, in decimal degrees, determined by manual measurement.
11. Precipitation—Mean-annual precipitation, in inches, determined from the isohyetal map in Knox and Nordenson (1955). The variation in mean-annual precipitation is shown in more detail in this map than in more recent sources.
12. Precipitation intensity—Maximum 24-hour rainfall, in inches, having a recurrence interval of 2 years. This characteristic was determined from U.S. Weather Bureau (1959b).
13. Snowfall—Average total seasonal snowfall, in inches, from an isohyetal map in Lautzenheiser (1969).
14. January temperature—Minimum January temperature, in degrees Fahrenheit, determined from U.S. Weather Bureau, (1959a).

Several basin characteristics were measured following the grid method by using transparent grids to compute area or an average contour value. Storage area is determined by randomly placing the grid over the water and marsh area and counting squares. If the water and marsh area is large enough (about 30 squares), the number of grid intersections within the storage area are counted. The storage area then is computed as the product of the square size and the number of grid intersections. To measure a contour value such as elevation, the grid spacing is selected to give at least 25 intersections within the basin boundary. The elevation at each grid intersection is determined and an average is computed. The percentage of a variable that is extensive in a drainage basin, such as forest cover, can be easily measured by counting the number of grid intersections occurring over the forested area, multiplying by 100, and dividing by the number of grid intersections within the basin.

Streamflow Characteristics

The available historic daily flow records were used to compute daily, monthly, and annual flow characteristics. A summary of these streamflow records is given in table 2 and the location of streamflow sites is shown in figures 2 and 3. These flow data were collected as part of the Survey's nationwide data-collection network through agreements with State and Federal agencies. Records of daily flow are available from the Survey's National Water Data Storage and Retrieval System (WATSTORE). This water-data computer processing system consists of several files containing data grouped by common characteristic and data-collection frequency.

The WATSTORE system includes site identification, daily values files, and computer programs that produce streamflow statistics. Hydrologic-data files are maintained for (1) parameters measured on a daily or continuous basis, such as streamflow values, river stages, water temperatures, specific conductance values, and ground-water levels; (2) annual peak values for streamflow and stage; (3) chemical analyses for surface- and ground-water sites; and (4) ground-water site inventory, including location, identification and geohydrologic characteristics. The data-processing, storage, retrieval, and analysis capabilities of WATSTORE are described in the system user's guide compiled by Hutchison (1975). Information on the availability of data analyses may be obtained from: U.S. Geological Survey, 150 Causeway Street, Suite 1309, Boston, MA 02114.

A brief description of the streamflow statistics computed using the WATSTORE system is included below. Streamflow characteristics representing annual, monthly, and daily flow statistics were selected for this analysis because they are useful in planning and design studies in this region. The streamflow statistics computed following the procedures given below are listed in table 4 (at the end of the report).

Annual and monthly flow characteristics (means and standard deviations) were computed for six gaging stations with the "Daily Values Monthly and Annual Statistics" computer program W4422 (Price and Meeks, 1977) using observed daily flow records. The maximum and minimum, monthly means (fig. 4 and table 4) were obtained from output provided by this program. The monthly hydrograph for the Indian Head River at Hanover is shown in figure 4.

Characteristics of the flow-duration curve (the daily flow exceeded 99, 95, 90, 75, 70, 50, 25, and 10 percent of the time) for six gaging stations were computed by means of computer program A969, "Daily Values Statistics" (Meeks, 1977). The flow-duration curve for the Indian Head River at Hanover is given in figure 5. Low-flow characteristics (annual 7-day mean low flows at the 2-year and 10-year recurrence intervals (7Q2 and 7Q10, respectively) at four gaging stations were also calculated by program A969. In this program, a log-Pearson Type III distribution is fitted to a set of observed annual 7-day mean low flows to obtain coordinates of the computed low-flow frequency curve. If the log-Pearson Type III developed curve did not adequately fit a plot of the observed data, especially in the low end, then a graphical curve was drawn. The graphical frequency curve was used to interpret the observed data when necessary because a graphical curve is the basic curve to use in analyzing the frequency of annual low flows according to Riggs (1971, 1972). The frequency curve for the Indian Head River at Hanover is shown in figure 6.

Additional flow data, including flood-frequency analyses, are available from WATSTORE. Peak discharges for selected recurrence intervals for 82 sites in Massachusetts are given in Wandle (1982).

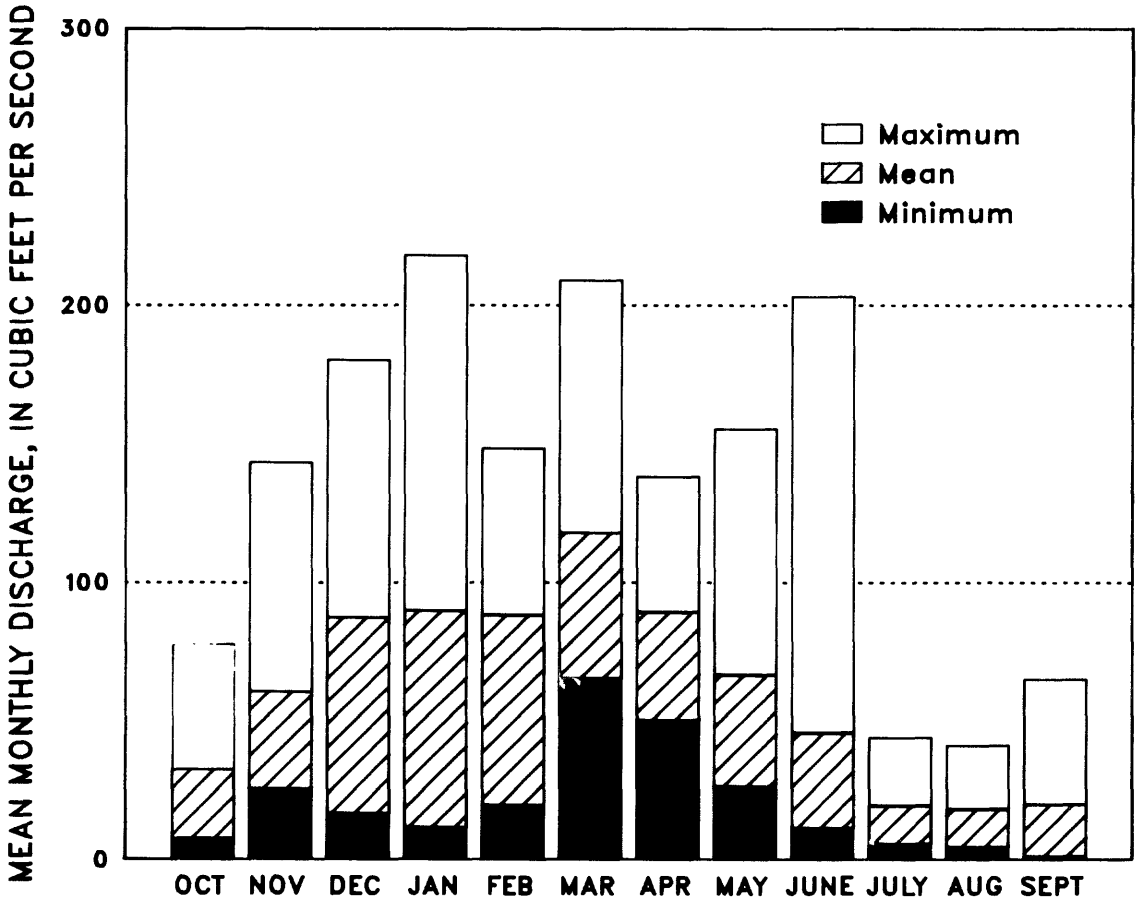

Figure 4.--Monthly discharges and extremes for the Indian Head River at Hanover, Mass. (site 6), during 1967-82

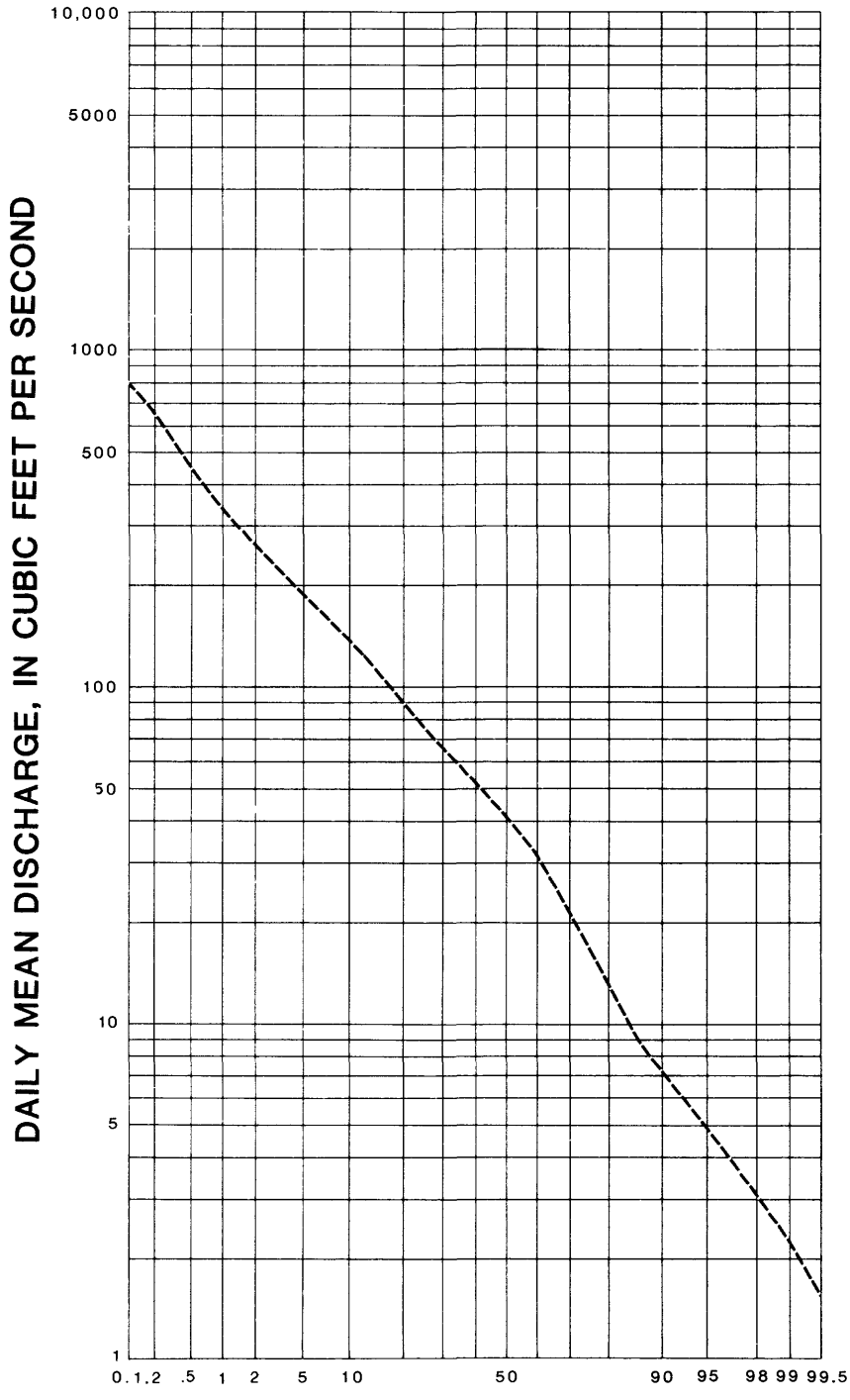

Figure 5.--Flow-duration curve for the Indian Head River at Hanover, Mass. (site 6), during 1967-82

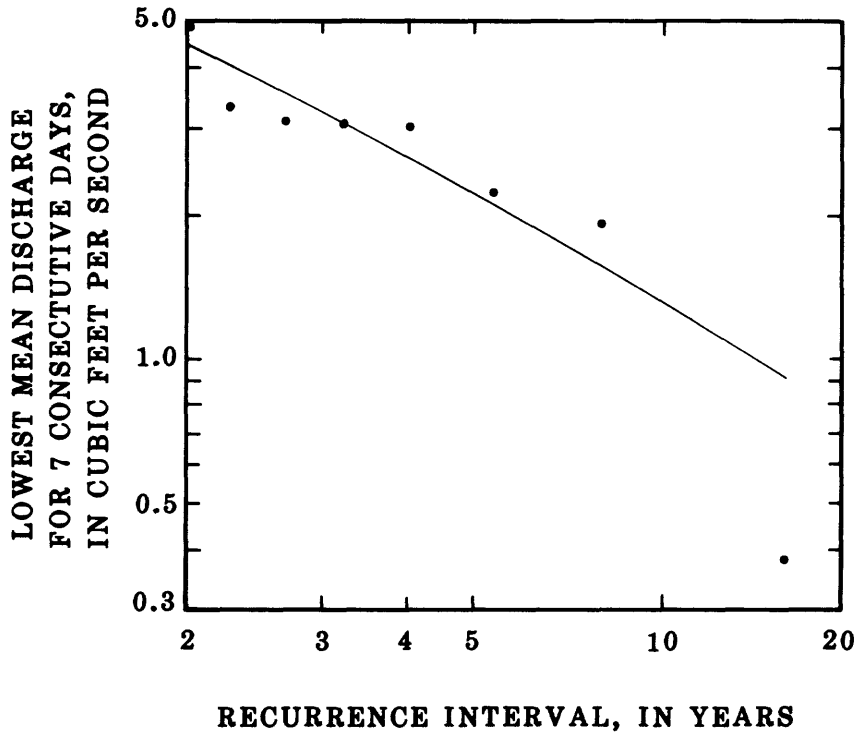

Figure 6.--Low-flow frequency curve for the Indian Head River at Hanover, Mass. (site 6), during 1968-82

Characteristics of low flow were also determined at low-flow partial-record stations where measurements of discharge, rather than a continuous daily flow record, were available. This estimating technique is briefly described in the section on Streamflow Analysis. The 7-day low-flow statistics were developed from discharge measurements made during periods of base runoff. Base runoff is defined (Langbein and Iseri, 1960) as "the sustained or fair weather runoff. In most streams, base runoff is composed largely of ground-water effluent." Base runoff usually occurs in most Massachusetts streams during the summer or early fall after 5 to 7 consecutive days without rainfall.

STREAMFLOW ANALYSIS

Streamflow Data Base

Systematic records of daily streamflow have been collected since 1967 for Indian Head and Jones Rivers. Short-term daily flow records are available for other streams in the coastal river basins. The location and period of record for these gaging stations are given in table 2.

Discharge measurements were made at 32 low-flow partial-record sites during the water-resources investigations of southeastern Massachusetts (Williams and Tasker, 1974a, 1974b, 1978). Measurements were also collected as part of the Massachusetts low-flow network at one site from 1978 to 1979 and at nine sites during 1965. Discharge measurements were made at four sites during an investigation of the geology and ground-water resources of the Brockton-Pembroke area (Petersen and Shaw, 1961). Additional discharge measurements were collected on the Mattapoisett River and its tributaries during 1982 to aid in the development of a digital ground-water-flow model of the Mattapoisett River Valley aquifer (Olimpio and de Lima, 1984).

Flow characteristics are useful in resource management and design studies if these variables represent a particular regulated flow sequence or the natural flow regime that is expected to occur in the future. A valid streamflow analysis is based upon flow records during a period of relatively constant river-basin conditions.

Daily Flow Statistics

Systematic daily flow records for the seven sites given in table 2 were reviewed to select a data base for statistical analysis. Impact of reservoirs, diversions, regulation, and withdrawals for public supplies on streamflows were assessed using information on stream regulation found in the series of water-resources data reports issued annually (see U.S. Geological Survey, 1980, for an example) and in Knox and Soule (1949). Streamflow records for six gaging stations were selected that represent a flow regime influenced by fairly constant river-basin conditions (Wandle, 1983). The record length used in this analysis is given in table 4. Low flow, monthly flow, and flow-duration characteristics given in table 4 were derived from the observed streamflow records at each station and were not adjusted for regulation or diversion. These daily streamflow characteristics were computed following procedures summarized in the section on streamflow characteristics.

Low-Flow Statistics

Continuous streamflow records are not necessary to estimate low-flow characteristics at sites. According to Riggs (1972) selected base-flow measurements rather than a continuous daily flow record can define the low-flow characteristics at a site.

Low-flow partial-record stations are operated to collect discharge measurements when streamflow is composed largely of ground-water runoff. These low-flow sites are selected on streams where flow is expected to occur during a significant dry spell and where the flow is not affected by artificial regulation. Base-flow measurements to define a relation with concurrent gaged flows are obtained over several low-flow periods.

A relation is developed with the base-flow measurements and the concurrent daily mean flows at a nearby long-record gaging station (index station). The 7-day low-flow statistics (7Q2 and 7Q10) for the site are determined from this relation using the appropriate low-flow statistics for the gaged stream. This estimating technique is explained in more detail by Riggs (1972).

An analysis of the 7-day low flows for the index stations indicated that the values were essentially the same for Williams and Tasker (1974a, 1974b, 1978) and for the current period. Low-flow relationships at the partial-record stations were not redefined except for Mattapoisett River because additional low-flow measurements were not available and because statistics for the index stations did not significantly change. Low-flow estimates for the three Mattapoisett sites were revised using the 1982 data. Information collected as part of the study by Olimpio and de Lima (1984) indicated that the streamflow loss in Williams and Tasker (1978) from site 43 to 46 is based upon unusually large losses in that reach.

Low-flow statistics for 49 sites in the coastal river basins of the South Shore and Buzzards Bay are summarized in table 5 (at the end of the report). The low-flow statistics are representative of the hydrologic regime during the data-collection period. Seven-day, 2-year, and 10-year low flows ranged from 0 to 1.47 and from 0 to 1.17 $(ft^3/s)/mi^2$, respectively, at the 49 partial-record stations. Nearby, long-term gaging stations were used as the index stations. These values were computed by Williams and Tasker (1974a, 1974b, 1978) following the procedures mentioned above.

SUMMARY

Drainage areas were re-computed for data-collection sites and were computed for the first time for ungaged streams draining greater than 3 mi^2. Basin characteristics for drainage area, slope, length, elevation, storage, lake area, forest, soil, latitude, longitude, precipitation, precipitation intensity, snowfall, and January minimum temperature are provided. Computer programs A969 and W4422 were used to determine daily flow statistics including annual and monthly flows, duration of daily flows, and 7-day low-flow values. Seven-day, 2-year, and 10-year low flows ranged from 0 to 1.47 and from 0 to 1.17 $(ft^3/s)/mi^2$, respectively, at the 49 partial-record stations.

Techniques used to compute basin and streamflow characteristics of a river basin are summarized. This gazetteer contains a comprehensive listing of hydrologic characteristics that should prove useful to those concerned with water-resources activities.

Table 1.--Stream-order listing, selected drainage areas, and locations of subbasins within the coastal river basins of the South Shore and Buzzards Bay

[Sites with streamflow information listed in tables 2, 4, or 5 are marked with an asterisk. The hierarchical listing is modified from Halliwell and others, 1982. Drainage areas are shown for sites as explained in the section on basin characteristics. These areas are not adjusted for manmade changes in the flow system.]

Stream name	Location	Drainage area, in square miles
COASTAL BASINS OF THE SOUTH SHORE		
Richardsons Brook		
James Brook		
Bailey Creek		
The Gulf		
Bound Brook	200 feet below Hunters Pond	11.4
Herring Brook		
Brass Kettle Brook		
Bound Brook	Doane Street	*4.86
Aaron River		
Musquashcut Brook		
Satuit Brook		
North and South Rivers	Combined mouths	105
North River		
Macombers Creek		
Hannah Eames Brook		
Bares Brook		
Herring River		
First Herring Brook	Maple Street	1.83
First Herring Brook	Grove Street	*1.74
Cove Brook		
Stony Brook		
North River	Bridge Street	70.1
Second Herring Brook	State Street 123	*3.15
Robinson Creek		
Third Herring Brook		
Copeland Tannery Brook		
Third Herring Brook	River Street	*9.78
Third Herring Brook	Jacobs Pond outlet	1.71
Wildcat Creek		
Wildcat Brook		
Silver Brook		
Mollys Brook		
Herring Brook		
Swamp Brook		
Pudding Brook	State Route 53	*4.52
McFarland Brook		
Pudding Brook	Spring Street	a1.38
Huldah Brook		
Little Pudding Brook		
Herring Brook	Mountain Avenue	*5.58

Table 1.—Stream-order listing, selected drainage areas, and locations of subbasins within the coastal river basins of the South Shore and Buzzards Bay (Continued)

Stream name	Location	Drainage area, in square miles
COASTAL BASINS OF THE SOUTH SHORE (Continued)		
North River (Continued)		
Indian Head River		
Iron Mine Brook		
Indian Head River	Elm Street	*30.2
Rocky Run		
Indian Head Brook	Washington Street	*4.30
Indian Head Brook	Wampatuck Pond outlet	*2.53
Drinkwater River		
Torrey Brook		
Drinkwater River	Forge Pond inlet	10.7
French Stream	Summer Street	*4.98
Cushing Brook	State Route 139	*4.15
Ben Mann Brook		
Longwater Brook		
Shinglemill Brook		
South River	Trouant Island	21.7
Branch Creek		
Broad Creek		
Littles Creek		
Unnamed tributary		
Furnace Brook	School Street	*.94
Furnace Brook	Furnace Street	*1.56
South River	Old Ocean Street	*7.59
Unnamed tributary		
Keene Brook		
Harlow Brook		
Philips Brook		
Green Harbor River	State Route 139	7.31
Wharf Creek		
Bass Creek		
Green Harbor Brook		
Back River		
Great Wood Island River		
Pine Point River		
Cut River		
Little Wood Island River		
Duck Hill River		
Bourne Wharf River		
Dug Way		
West Brook		
Bluefish River		
Island Creek		
Jones River	Mouth	29.6
Unnamed tributary		
Smelt Brook		

Table 1.--Stream-order listing, selected drainage areas, and locations of subbasins within the coastal river basins of the South Shore and Buzzards Bay (Continued)

Stream name	Location	Drainage area, in square miles
COASTAL BASINS OF THE SOUTH SHORE (Continued)		
Jones River (Continued)		
Halls Brook	600 feet above State Route 3A	*3.98
Tussock Brook		
Mile Brook		
Bassett Brook		
Unnamed tributary		
Second Brook		
Jones River	Elm Street	*19.8
Furnace Brook		
Fountainhead Brook		
Jones River	Private road	*10.6
Pine Brook	Grove Street	4.72
Pine Brook	75 feet below State Route 27	b*3.14
Jones River Brook	State Route 106	*3.57
Barrows Brook		
Jones River	Silver Lake outlet	*4.09
Tubbs Meadow Brook		
Town Brook	Mouth	*9.04
Eel River	State Route 3A	*14.7
Unnamed tributary		
Beaver Dam Brook	800 feet above mouth	*5.52
Indian Brook		
Herring River	Mouth	*7.74
COASTAL BASINS OF BUZZARDS BAY		
Red Brook	Red Brook Road	*9.84
East River		
Gibbs Brook		
Bass Creek		
Wareham River		
Cedar Island Creek		
Crooked River		
Broad Marsh River		
Stony Run		
Agawam River	800 feet below Mill Pond	*17.1
Maple Springs Brook		
East Branch		
Agawam River	600 feet below Halfway Pond outlet	*6.71
Wankinco River	1000 feet below Parker Mills Pond	*20.5
Rose Brook		
Harlow Brook		
Frogfoot Brook		

Table 1.--Stream-order listing, selected drainage areas, and locations of subbasins within the coastal river basins of the South Shore and Buzzards Bay (Continued)

Stream name	Location	Drainage area, in square miles
COASTAL BASINS OF BUZZARDS BAY (Continued)		
Weweantic River		
Beaverdam Creek		
Sippican River	County Road	*28.1
Cohackett Brook		
Hales Brook		
Benson Brook		
Doggett Brook	State Route 105	3.14
Sherman Brook		
East Branch Sippican River		
West Branch Sippican River		
Weweantic River	Squire Island Road	*56.1
Crane Brook		
Indian Brook		
Sampson Brook		
Tilson Brook		
Double Brook		
East Rocky Gutter Brook		
West Rocky Gutter Brook		
Rocky Meadow Brook		
South Meadow Brook		
Beaver Dam Brook		
Aucoot Creek	U.S. Route 6	*2.71
Mattapoisett River	0.4 mile above U.S. Route 6	*24.0
Mattapoisett River	Acushnet Road	*23.5
Mattapoisett River	Tinkham Lane	*18.2
Branch Brook		
Mattapoisett River	Wolf Island Road	14.1
Mattapoisett River	New Bedford Road	*13.1
Mattapoisett River	Rounseville Road	*11.2
Mattapoisett River	Snipatuit Road	6.45
Swift Brook	0.1 mile above Mattapoisett Neck Road	*1.18
Swift Brook	U.S. Route 6	*.78
Nasketucket River		
Acushnet River	Main Street	18.7
Acushnet River	Hamlin Road	*16.4
Deep Brook		
Acushnet River	Road 1 mile below Leonard Street	10.1
Acushnet River	Leonard Street	*7.52
Keene River		
Squam Brook		
Ashley Brook		
Buttonwood Brook	Russells Mills Road	*2.93
Little River		

Table 1.--Stream-order listing, selected drainage areas, and locations of subbasins within the coastal river basins of the South Shore and Buzzards Bay (Continued)

Stream name	Location	Drainage area, in square miles
	COASTAL BASINS OF BUZZARDS BAY (Continued)	
Slocums River	Mouth	37.6
Giles Creek		
Peter Creek		
Destruction Brook	Slades Corner Road	*2.64
Paskamanset River	Fisher Road	28.5
Paskamanset River	Russells Mills Road	*26.2
Paskamanset River	2.5 miles above Russells Mills Road	20.0
Paskamanset River	U.S. Route 6	15.9
Paskamanset River	Turner Pond outlet	8.14

a From U.S. Geological Survey, 1964.
b From Petersen, 1962.

Table 2.—Summary of daily flow records available in the coastal river basins of the South Shore and Buzzards Bay

Number in figures 2 and 3	Station number	Station name	Location	Period of record	Remarks
1	01105660	Bound Brook near Cohasset, Mass.	Doane Road	1971	Discontinued.
5	01105700	Indian Head Brook near Hanson, Mass.	Washington Street	1959-60	Some regulation by ponds. Discontinued.
6	01105730	Indian Head River at Hanover, Mass.	Elm Street	1967-82	Some regulation by mills and ponds. Water-quality records 1970-71.
8	01105800	Pudding Brook at East Pembroke, Mass.	Spring Street	1959-62	Regulated by Randall Pond. Discontinued.
14.5	01105850	Furnace Brook near Marshfield, Mass.	Furnace Street	1964-82	Peak-flow site.
19	01105870	Jones River at Kingston, Mass.	Elm Street	1967-82	Regulated by pond upstream. Flow from Silver Lake diverted for municipal supplies of Brockton, Whitman, and Hanson. Flow affected at times during spring by wastage from Silver Lake. Surface flow may be affected by ground water that enters from or moves into adjacent basins. Water-quality records 1970-71.
22	01105876	Eel River near Plymouth, Mass.	State Route 3A	1970-71	Surface flow may be affected by ground water that enters from or moves into adjacent basins. Water-quality records. Discontinued.
29	01105895	Weweantic River at South Wareham, Mass.	Squire Island Road	1970-71	Some regulation by ponds. Water-quality records. Discontinued.

Table 3.--Basin characteristics for selected stream-gaging stations in the coastal river basins of the South Shore and Buzzards Bay

Basin characteristics	Station name and site number			
	Indian Head Brook near Hanson, Mass.	Indian Head River at Hanover, Mass.	Pudding Brook at East Pembroke, Mass.	Furnace Brook near Marshfield, Mass.
	(5)	(6)	(8)	(14.5)
Area, in square miles	4.30	30.2	a1.38	1.56
Slope, in feet per mile	—	—	—	2.5
Length, in miles	—	—	—	2.7
Elevation, in feet	—	—	—	160
Storage, in percent	—	—	—	0
Lake area, in percent	—	—	—	0
Forest, in percent	—	—	—	95
Soils index, in inches	—	—	—	5.6
Latitude of gage, in decimal degrees	42.0869	42.0337	42.0305	42.1083
Longitude of gage, in decimal degrees	70.8572	70.8231	70.7578	70.7314
Precipitation, in inches	—	—	—	44.0
Precipitation intensity for 2-year recurrence interval, in inches	—	—	—	3.3
Snowfall, in inches	—	—	—	40.0
January minimum temperature, in degrees Fahrenheit	—	—	—	21.0

a From U.S. Geological Survey, 1964.

Table 3.--Basin characteristics for selected stream-gaging stations in the coastal river basins of the South Shore and Buzzards Bay (Continued)

Basin characteristics	Station name and site number		
	Jones River at Kingston, Mass. (19)	Eel River near Plymouth, Mass. (22)	Weweantic River at South Wareham, Mass. (29)
Area, in square miles	b15.7	14.7	56.1
Slope, in feet per mile	--	--	--
Length, in miles	--	--	--
Elevation, in feet	--	--	--
Storage, in percent	--	--	--
Lake area, in percent	--	--	--
Forest, in percent	--	--	--
Soils index, in inches	--	--	--
Latitude of gage, in decimal degrees	41.9908	41.9417	41.7700
Longitude of gage, in decimal degrees	70.2625	70.6231	70.2706
Precipitation, in inches	--	--	--
Precipitation intensity for 2-year recurrence interval, in inches	--	--	--
Snowfall, in inches	--	--	--
January minimum temperature, in degrees Fahrenheit	--	--	--

b Excludes 4.09 mi^2 above Silver Lake outlet.

Table 4.--Streamflow characteristics, in cubic feet per second, at selected stream-gaging stations

Annual and monthly flow characteristics:

QA is the mean annual discharge

SDQA is the standard deviation of mean annual discharge

QM is the mean discharge for M calendar month, M = 1 for January where the top line is the maximum mean; the middle line is the mean; the bottom line is the minimum mean

SDQM is the standard deviation of mean discharge for M calendar month

Low-flow characteristics:

7Q2 is the annual minimum 7-day mean discharge for 2-year recurrence interval

7Q10 is the annual minimum 7-day mean discharge for 10-year recurrence interval

Flow-duration characteristics:

DPT is the daily discharge, exceeded PT percent of the time, from the flow-duration curve

Years of record:

YRSDAY is the number of years of daily flow record for this analysis

YRSLOW is the number of years of low-flow record for this analysis

Flow	Station name and site number					
	Indian Head Brook near Hanson, Mass. (5)	Indian Head River at Hanover, Mass. (6)	Pudding Brook at East Pembroke, Mass. (8)	Jones River at Kingston, Mass. (19)	Eel River near Plymouth, Mass. (22)	Weweantic River at South Wareham, Mass. (29)
ANNUAL						
QA	—	61.2	—	30.4	—	—
SDQA	—	13.5	—	54.0	—	—
MONTHLY						
Q10	6.56	77.5	2.74	43.2	—	—
	—	32.1	—	17.4	—	—
	3.44	7.36	1.85	7.95	—	—
SDQ10	—	23.6	—	10.2	—	—
Q11	7.66	143	2.61	66.0	—	—
	—	60.4	—	27.2	—	—
	5.59	25.1	1.92	5.71	—	—
SDQ11	—	34.5	—	15.0	—	—
Q12	8.50	180	2.54	76.8	—	—
	—	87.3	—	35.5	—	—
	5.40	16.4	2.15	10.8	—	—
SDQ12	—	50.7	—	21.6	—	—

Table 4.--Streamflow characteristics, in cubic feet per second, at selected stream-gaging stations (Continued)

Flow	Station name and site number					
	Indian Head Brook near Hanson, Mass. (5)	Indian Head River at Hanover, Mass. (6)	Pudding Brook at East Pembroke, Mass. (8)	Jones River at Kingston, Mass. (19)	Eel River near Plymouth, Mass. (22)	Weweantic River at South Wareham, Mass. (29)
MONTHLY (Continued)						
Q1	9.28	218	3.33	78.2	28.5	139
	—	89.8	—	37.6	—	—
	4.26	11.4	1.75	9.00	24.2	64.0
SDQ1	—	58.2	—	19.4	—	—
Q2	13.7	148	3.19	66.1	31.4	215
	—	88.1	—	43.1	—	—
	6.78	19.4	2.08	20.1	30.7	133
SDQ2	—	31.0	—	12.3	—	—
Q3	14.0	209	3.48	95.0	31.0	190
	—	118	—	53.0	—	—
	13.5	65.3	3.08	31.9	30.2	142
SDQ3	—	47.6	—	17.9	—	—
Q4	14.1	138	3.71	61.9	35.0	179
	—	89.2	—	41.7	—	—
	12.2	49.8	3.07	21.4	25.8	97.7
SDQ4	—	25.7	—	11.0	—	—
Q5	6.43	155	3.42	67.7	33.1	119
	—	66.5	—	36.5	—	—
	5.87	26.1	2.47	14.9	27.6	72.5
SDQ5	—	35.5	—	15.6	—	—
Q6	6.53	203	2.76	69.3	31.6	78.6
	—	45.4	—	25.3	—	—
	2.63	11.4	1.81	9.56	25.7	55.9
SDQ6	—	46.4	—	14.3	—	—
Q7	7.56	43.7	2.31	37.5	27.7	46.0
	—	19.4	—	15.3	—	—
	1.80	5.68	1.50	6.34	23.5	25.0
SDQ7	—	17.5	—	7.60	—	—

Table 4.--Streamflow characteristics, in cubic feet per second, at selected stream-gaging stations (Continued)

Flow	Station name and site number					
	Indian Head Brook near Hanson, Mass.	Indian Head River at Hanover, Mass.	Pudding Brook at East Pembroke, Mass.	Jones River at Kingston, Mass.	Eel River near Plymouth, Mass.	Weweantic River at South Wareham, Mass.
	(5)	(6)	(8)	(19)	(22)	(29)
MONTHLY (Continued)						
Q8	4.35	40.9	1.87	42.9	23.8	36.5
	—	18.1	—	16.0	—	--
	.76	4.47	1.64	4.79	21.6	16.7
SDQ8	—	13.3	—	8.88	—	--
Q9	5.02	65.0	2.48	45.5	23.3	23.0
	—	19.9	—	16.1	—	--
	1.38	1.13	1.79	5.49	18.8	12.5
SDQ9	—	18.4	—	10.6	—	--
LOW FLOW						
7Q2	—	4.6	—	6.8	(1)	(1)
7Q10	—	1.3	—	2.2	(1)	(1)
FLOW DURATION						
D99	.40	2.2	1.2	4.5	18.2	11.3
D95	.79	4.6	1.4	6.7	19.1	13.0
D90	.93	7.1	1.5	8.4	20.5	15.6
D75	2.7	16.7	1.8	13.6	23.4	24.9
D70	3.3	21.2	1.9	15.4	24.0	31.4
D50	6.0	41.4	2.3	23.6	25.7	56.4
D25	10.0	77.4	2.9	39.1	28.2	117
D10	14.3	142	3.6	59.9	33.6	167
YEARS						
YRSDAY	2	16	4	16	2	2
YRSLOW	—	15	—	16	—	—

[1]Estimates are given in table 5.

Table 5.--Summary of 7-day low-flow characteristics, drainage area, and period of record for low-flow partial-record stations and miscellaneous sites

Number in figures 2 and 3	Station number	Station name	Location	Period of record	Drainage area, in square miles	Estimated annual minimum 7-day mean low flow, in cubic feet per second, at indicated recurrence interval	
						2-year	10-year
		COASTAL BASINS OF THE SOUTH SHORE					
1	01105660	[1]Bound Brook near Cohasset, Mass.	Doane Street	1969-70, 1978-79	4.86	0.1	0.0
2	01105680	[2]Cushing Brook at West Hanover, Mass.	State Route 139	1969-71	4.15	.2	.0
3	01105690	[2]French Stream near Rockland, Mass.	Summer Street	1969-71	4.98	1.1	.5
4	01105698	Indian Head Brook at Hanson, Mass.	Wampatuck Pond outlet	1958-60	2.53	—	—
5	01105700	[1]Indian Head Brook near Hanson, Mass.	Washington St.	1965, 1969-71	4.30	.5	.2
7	01105770	[3]Herring Brook at Pembroke, Mass.	Mountain Ave.	1958-60, 1965, 1969-71	5.58	1.0	.6
9	01105805	[4]Pudding Brook at North Pembroke, Mass.	State Route 53	1958-60, 1969-71	4.52	.5	.3
10	01105810	Third Herring Brook at Hanover, Mass.	River Street	1969-71	9.78	.4	.0
11	01105820	Second Herring Brook at Norwell, Mass.	State Route 123	1969-71	3.15	.2	.0
12	01105830	First Herring Brook near Scituate Center, Mass.	Grove Street	1969-71	1.74	<.1	.0
13	01105845	South River at Marshfield, Mass.	Old Ocean Street	1969-71	7.59	2.0	1.5
14	01105848	Furnace Brook near Marshfield, Mass.	School Street	1970-71	.94	<.1	.0
15	01105856	[2]Jones River at outlet of Silver Lake near Kingston, Mass.	Silver Lake outlet	1965	4.09	—	—
16	01105858	Pine Brook near Kingston, Mass.	75 feet below State Route 27	1958-60	[5]3.14	—	—
17	01105860	Jones River Brook near Plympton, Mass.	State Route 106	1965, 1969-71	3.57	.9	.6
18	01105862	[2]Jones River near Kingston, Mass.	Private road	1965	10.6	—	—

Table 5.--Summary of 7-day low-flow characteristics, drainage area, and period of record for low-flow partial-record stations and miscellaneous sites (Continued)

Number in figures 2 and 3	Station number	Station name	Location	Period of record	Drainage area, in square miles	Estimated annual minimum 7-day mean low flow, in cubic feet per second, at indicated recurrence interval	
						2-year	10-year
		COASTAL BASINS OF THE SOUTH SHORE (Continued)					
20	01105872	Halls Brook at Kingston, Mass.	600 feet above State Route 3A	1969-71	3.98	3.8	2.2
21	01105874	[6]Town Brook at Plymouth, Mass.	At mouth	1969-71	9.04	11	9.2
22	01105876	[1]Eel River near Plymouth, Mass.	State Route 3A	1969-70	14.7	18	15
23	01105878	Beaver Dam Brook at White Horse Beach, Mass.	800 feet above mouth	1969-71	5.52	6.2	4.6
24	01105883	Herring River at Bournedale, Mass.	At mouth	1969-71	7.74	3.8	2.3
		COASTAL BASINS OF BUZZARDS BAY					
25	01105886	[7]Red Brook near Buzzards Bay, Mass.	Red Brook Road	1969-71	9.84	3.8	1.8
26	01105888	Agawam River near Ellisville, Mass.	600 feet below Halfway Pond	1969-71	6.71	8.0	7.0
27	01105890	[7]Agawam River at East Wareham, Mass.	800 feet below Mill Pond	1969-71	17.1	25	20
28	01105892	[7]Wankinco River at Wareham, Mass.	1000 feet below Parker Mills Pond	1969-71	20.5	12	8.0
29	01105895	[1 8]Weweantic River at South Wareham, Mass.	Squire Island Road	1964-70	56.1	15	10
30	01105905	Sippican River near Marion, Mass.	County Road	1972-74	28.1	5.0	3.5
31	01105908	Aucoot Creek near Marion, Mass.	U.S. Highway 6	1972-74	2.71	.1	<.1
32	011059101	[4]Mattapoisett River at outlet of Snipatuit Pond, near Rochester, Mass.	Snipatuit Pond outlet	1982	—	—	—
33	011059105	[4]Mattapoisett River at Hartley Road, near Rochester, Mass.	Hartley Road	1982	—	—	—
34	011059106	Mattapoisett River tributary No. 1 near Rochester, Mass.	Hartley Road	1982	—	—	—

Table 5.--Summary of 7-day low-flow characteristics, drainage area, and period of record for low-flow partial-record stations and miscellaneous sites (Continued)

Number in figures 2 and 3	Station number	Station name	Location	Period of record	Drainage area, in square miles	Estimated annual minimum 7-day mean low flow, in cubic feet per second, at indicated recurrence interval	
						2-year	10-year
		COASTAL BASINS OF BUZZARDS BAY (Continued)					
35	011059107	Mattapoisett River tributary No. 2 near Rochester, Mass.	Cushman Road	1982	—	—	—
36	01105911	[4 9]Mattapoisett River near Rochester, Mass.	Rounseville Road	1972-74, 1982	11.2	1.5	0.8
37	011059115	[4]Mattapoisett River at New Bedford Road, near Rochester, Mass.	New Bedford Road	1982	13.1	—	—
38	01105912	[4]Mattapoisett River, at old dam near Rochester, Mass.	Remains of old dam	1965, 1982	—	—	—
39	011059125	Mattapoisett River tributary No. 3 near Rochester, Mass.	Mattapoisett Road	1982	—	—	—
40	01105913	[4]Mattapoisett River near Wolf Island Road, near Rochester, Mass.	0.2 mile below Wolf Island Rd.	1982	—	—	—
41	011059132	Branch Brook near Mattapoisett, Mass.	Wolf Island Road	1982	--	—	--
42	011059135	Crystal Spring near Mattapoisett, Mass.	30 feet below bridge on dirt road (formerly Tinkham Lane)	1982	—	—	—
43	01105914	[4 9]Mattapoisett River near Mattapoisett, Mass.	Tinkham Lane	1972-74, 1982	18.2	3.2	2.0
44	01105915	Mattapoisett River tributary No.4, near Mattapoisett, Mass.	Tinkham Pond outlet	1982	—	—	—
45	01105916	[4]Mattapoisett River near Acushnet Road, near Mattapoisett, Mass.	Footbridge above Acushnet Road	1982	23.5	—	--
46	01105917	[4 9 10]Mattapoisett River near Mattapoisett, Mass.	0.4 mile above U.S. Route 6	1965, 1972-74, 1982	24.0	4.1	2.5

Table 5.--Summary of 7-day low-flow characteristics, drainage area, and period of record for low-flow partial-record stations and miscellaneous sites (Continued)

Number in figures 2 and 3	Station number	Station name	Location	Period of record	Drainage area, in square miles	Estimated annual minimum 7-day mean low flow, in cubic feet per second, at indicated recurrence interval	
						2-year	10-year
		COASTAL BASINS OF BUZZARDS BAY (Continued)					
47	01105920	Swift Brook at East Fairhaven, Mass.	U.S. Route 6	1965	0.78	—	—
48	01105921	Swift Brook near Mattapoisett, Mass.	0.1 mile above Mattapoisett Neck Road	1972-73	1.18	0.0	0.0
49	01105924	[11] Acushnet River at Leonard Street, near Acushnet, Mass.	Leonard Street	1972-74	7.52	.3	.1
50	01105926	[11] Acushnet River at Acushnet, Mass.	Hamlin Road	1972-74	16.4	.9	.3
51	01105928	Buttonwood Brook near South Dartmouth, Mass.	Russells Mills Road	1972-74	2.93	<.1	.0
52	01105933	[10] Paskamanset River near South Dartmouth, Mass.	Russells Mills Road	1972-74	26.2	1.5	.7
53	01105935	Destruction Brook near South Dartmouth, Mass.	Slades Corner Road	1972-74	2.64	.3	.1

[1] Recording gage, refer to table 2.

[2] Flow affected by diversion.

[3] Some regulation by ponds. Flow affected by diversion.

[4] Some regulation by pond or ponds.

[5] From Petersen, 1962.

[6] Diversion from Little South Pond for Plymouth water supply.

[7] Some regulation by operation of cranberry bogs.

[8] Flow regulated by ponds.

[9] Some unpublished daily records during 1959-60 and 1981-82 are on file in the Massachusetts Office.

[10] Streamflow affected by withdrawal of ground water.

[11] Diversion from New Bedford Reservoir.

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