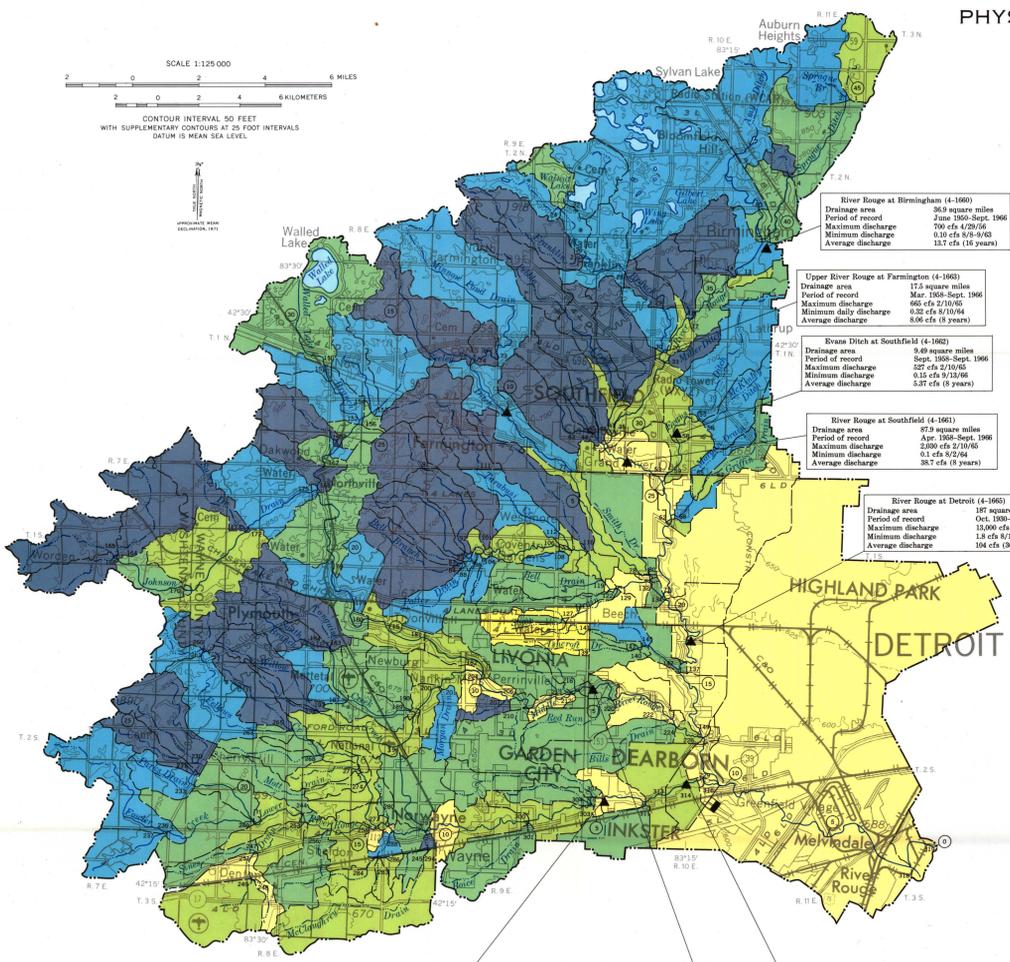


PHYSICAL SETTING AND SURFACE WATER



EXPLANATION

- Average slope of stream in sub-basin, in feet per mile
- 0.0-4.9
- 5.0-9.9
- 10-14.9
- 15-25
- >25
- Number key of selected sites where physiographic data are available (see pamphlet)
- River mile above mouth
- Gaging station
- Precipitation station
- Temperature station
- Basin boundary
- Sub-basin boundary

- River Rouge at Birmingham (4-1960)
Drainage area 38.9 square miles
Period of record Mar. 1908-Sept. 1966
Maximum discharge 700 cfs 4/29/56
Minimum discharge 0.19 cfs 6/8-9/43
Average discharge 137 cfs (8 years)
- Upper River Rouge at Farmington (4-1960)
Drainage area 17.5 square miles
Period of record Mar. 1908-Sept. 1966
Maximum discharge 665 cfs 2/10/56
Minimum discharge 0.19 cfs 6/8-9/43
Average discharge 8.06 cfs (8 years)
- River Rouge at Southfield (4-1961)
Drainage area 87.9 square miles
Period of record Apr. 1908-Sept. 1966
Maximum discharge 2,050 cfs 2/10/56
Minimum discharge 0.1 cfs 6/21/66
Average discharge 38.7 cfs (8 years)
- River Rouge at Detroit (4-1960)
Drainage area 187 square miles
Period of record Oct. 1908-Sept. 1966
Maximum discharge 13,000 cfs 4/14/47
Minimum discharge 1.8 cfs 8/1-2/64
Average discharge 104 cfs (8 years)

- Lower River Rouge at Inkster (4-1960)
Drainage area 91.9 square miles
Period of record Oct. 1908-Sept. 1966
Maximum discharge 1,400 cfs 5/17/53
Minimum discharge 0.2 cfs 9/2/53
Average discharge 38.1 cfs (8 years)
- Middle River Rouge near Garden City (4-1970)
Drainage area 99.9 square miles
Period of record Oct. 1908-Sept. 1966
Maximum discharge 2,300 cfs 2/10/56
Minimum discharge 0.9 cfs 8/16/56
Average discharge 62.8 cfs (12 years)
- Lower River Rouge at Dearborn (4-1960)
Drainage area 91.9 square miles
Period of record Oct. 1908-Sept. 1966
Maximum discharge 1,400 cfs 5/17/53
Minimum discharge 0.2 cfs 9/2/53
Average discharge 38.1 cfs (8 years)

Purpose and scope

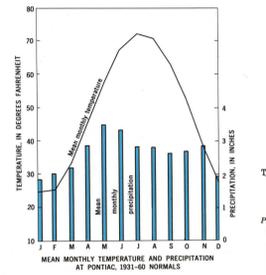
This hydrologic atlas represents a part of a comprehensive study of the water resources of southeastern Michigan. Its purpose is to provide information on (1) the physical features of the River Rouge and its tributaries, (2) the characteristics of streamflow, (3) the quality of ground and surface water, and (4) the availability of the ground-water. The atlas is one in a series on several river basins in southeastern Michigan.

Physical description

The River Rouge basin, a triangular area of 677 square miles, is characterized by hilly or moderately undulating topography in the north and west and by relatively flat land to the southeast. Most of the basin was covered by waters of former glacial lakes, as evidenced by old beach lines which traverse the basin. Sands and clays laid down in glacial lakes make up the surface deposits in the southeastern two-thirds of the basin. Areas to the northwest are principally moraine deposits of retreating glaciers. Altitudes in the moraine areas range from 500 to more than 1,000 feet above sea level. Altitude gradually lessens toward the southeast to about 600 feet above sea level and down to 274 feet at the mouth of the River Rouge.

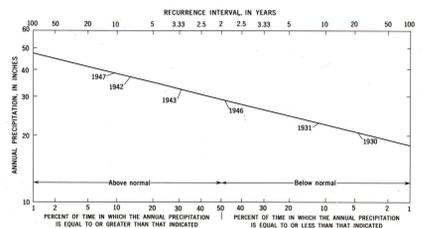
Population and economy

The River Rouge basin lies within the Detroit Metropolitan area and, except for isolated areas, the basin has been urbanized. In much of the basin population densities are among the highest in the state. The economy is centered principally around the manufacture of automobiles. Large automotive industries are located principally in the southeastern part of the basin. Elsewhere industrial plants are smaller and in addition to automobile parts provide such products as machinery, machine tools, fabricated metals, electrical machinery, and textiles.

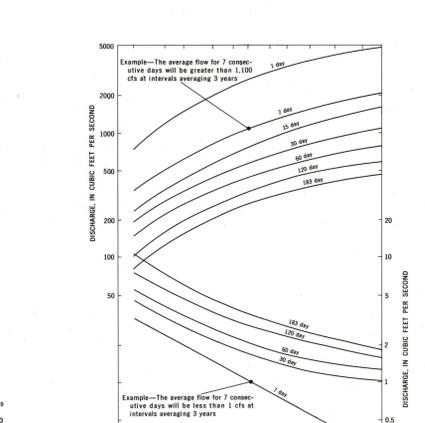
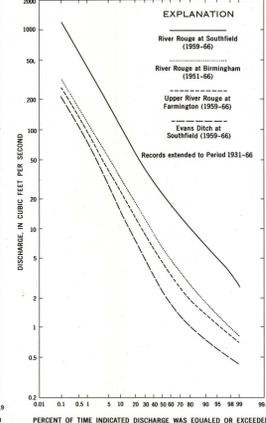
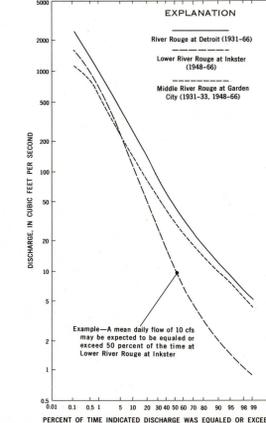


Summary Station	Pontiac	Willow Run
Mean annual temperature (°F)	45.4	50.0
Mean annual precipitation (inches)	30.99	30.67
Mean annual snowfall (inches)	34.2	30.9
Average frost-free season	5/7 to 10/11	5/7 to 10/7

THE CLIMATE OF THE ROUGE RIVER IS MODIFIED BY THE GREAT LAKES WHICH LOWER THE TEMPERATURES DURING THE SUMMER AND WARM THEM DURING THE WINTER MONTHS AND AS A CONSEQUENCE THE EXTREMES IN TEMPERATURE ARE MINIMIZED. Precipitation is uniformly distributed throughout the year, but is slightly greater during the winter months. Differences in climate between the northern and southern parts of the basin are small. A local variation is experienced in the Detroit area, however, where extensive urban development influences normal weather patterns. These differences, termed collectively as the "heat island effect," are believed to be caused by convective activity, and a greater than normal supply of precipitation, a result of air pollution. The net result is unusually intense air-mass type thunderstorms.



THE AVERAGE RECURRENCE INTERVAL FOR THE TOTAL PRECIPITATION FOR ANY YEAR MAY BE DETERMINED FROM A FREQUENCY DISTRIBUTION CURVE. The above curve is based on precipitation data for the period 1908-66 as measured at Pontiac State Hospital. Although the station is outside the Rouge basin it is representative of conditions which may be expected in the basin. Years designated on the curve are those for which unusually high or low runoff was measured in the Rouge basin (see "Annual Runoff in the River Rouge Basin").



EXPLANATION

River Rouge at Detroit (1931-60)
Lower River Rouge at Inkster (1948-66)
Middle River Rouge at Garden City (1931-33, 1948-66)

EXPLANATION

River Rouge at Birmingham (1959-66)
River Rouge at Southfield (1959-66)
Evans Ditch at Southfield (1959-66)
Records extended to period 1931-66

EXPLANATION

River Rouge at Detroit (1931-60)
Lower River Rouge at Inkster (1948-66)
Middle River Rouge at Garden City (1931-33, 1948-66)

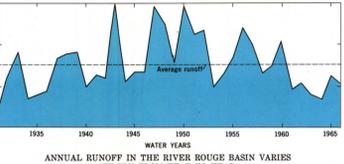
EXPLANATION

River Rouge at Birmingham (1959-66)
River Rouge at Southfield (1959-66)
Evans Ditch at Southfield (1959-66)
Records extended to period 1931-66

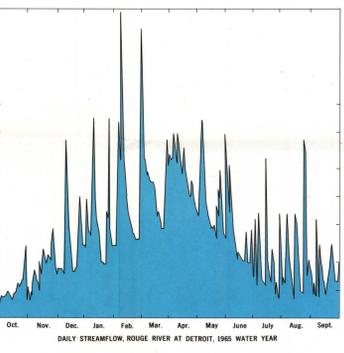
EXPLANATION

River Rouge at Birmingham (1961-66)

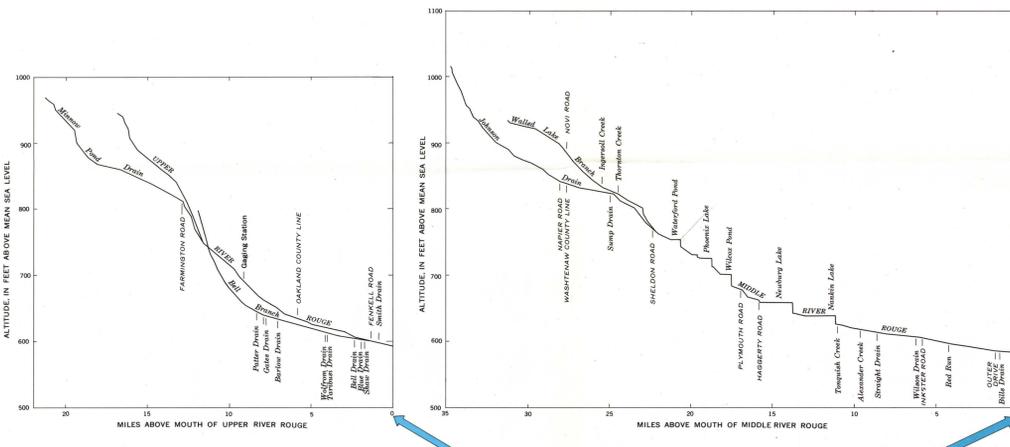
THE RIVER ROUGE BASIN IS CHARACTERIZED BY MODERATELY HILLY TOPOGRAPHY TO THE NORTHWEST GRADUATING TO A RELATIVELY LEVEL LAND SURFACE TO THE SOUTHEAST. Stream gradients near the northwestern basin divide are relatively steep, but many become more steep in reaches where they cross beach lines of former glacial lakes. In the lower reaches of the River Rouge gradients lessen.



ANNUAL RUNOFF IN THE RIVER ROUGE BASIN VARIES WIDELY FROM YEAR TO YEAR. Runoff at River Rouge at Detroit ranged from 11.83 inches in 1943 to 1.86 inches in 1961. Extremes in runoff are due to precipitation patterns and, in general, are dependent on trends for more than one year. For example, deficient precipitation in the late 1950s and early 1960s, combined with a curve of annual precipitation estimated in the low runoff of 1961. Conversely, but less dependent upon major year precipitation trends, above normal precipitation results in higher flows. Above normal runoff for 1943-45 are reflected in higher flows of 1943. Excessive runoff of 1947, however, followed a year of near-normal precipitation.

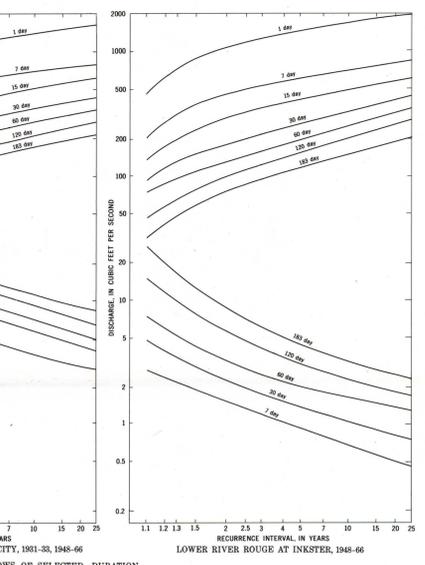
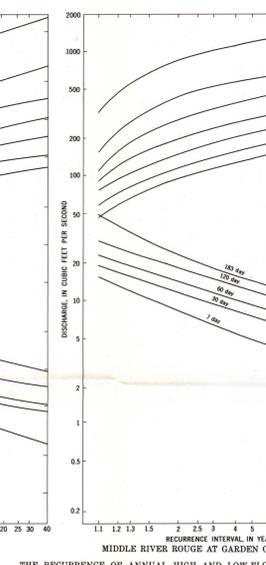
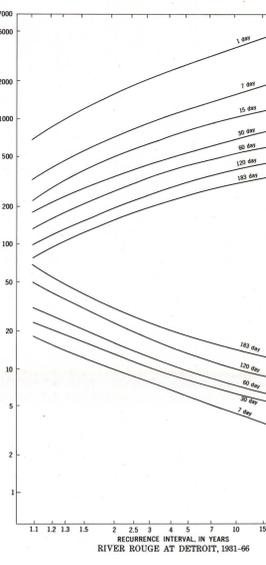


IN ADDITION TO THE YEAR-TO-YEAR VARIATION IN TOTAL RUNOFF THERE ALSO IS A WITHIN-YEAR CYCLICAL VARIATION. Runoff is normally highest in the late winter and spring months followed by a general recession to lower flows in late summer and early fall. Periodic variations from the general pattern are caused by rain and other climatic influences. Compact soils with low infiltration rates (see text) and extensive urban areas result in rapid increases in streamflow following periods of rain or snowmelt. Resistant peak discharges, however, are abated and streamflow normally returns to lower discharges and base flow.



STREAM GRADIENTS IN THE RIVER ROUGE BASIN ARE RELATIVELY STEEP EXCEPT IN THE LOWER REACHES WHERE THEY ARE LOW

The average slope for River Rouge is 4.9 feet per mile. Average slopes for the Upper, Middle and Lower River Rouge are 21.6, 12.6, and 10.9 feet per mile, respectively. Tributary streams such as Peble Creek, Franklin Branch, Bell Branch, Auburn Branch, and others not illustrated have average slopes ranging from 17 to 26 feet per mile, and, for some reaches, have gradients approaching 100 feet per mile. Because of small flows during much of the time the streams have not been fully utilized for power production. Several dams have been constructed on the Middle River Rouge, but power generation has been discontinued. Stream gradients may be approximated from the river profiles by comparing the slope for any reach with the lines shown for various slopes to the left of the River Rouge profile. More accurate values may be computed from mileage and altitude values given in the table of physiographic data (see pamphlet).



THE RECURRENT OF ANNUAL HIGH AND LOW-FLOWS OF SELECTED DURATION MAY BE DETERMINED FROM FREQUENCY CURVES. The shape of the high-flow frequency curves (upper family of curves for each station) is governed by climate and basin physiography. Higher flows in the Rouge basin impede infiltration, cause higher flows, and a comparatively higher proportion of streamflow from overland runoff. Lower-flow frequency curves (lower family of curves) reflect geomorphologic conditions and indicate the contributions to streamflow from ground-water sources. Streams in the Rouge basin recede to relatively low

WATER RESOURCES OF THE RIVER ROUGE BASIN, SOUTHEASTERN MICHIGAN

By
R. L. Knutilla
1971