

PHYSICAL SETTING AND SURFACE WATER

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 Raisin and its tributaries, (2) the characteristics of streamflow, (3) the quality of surface and ground water, and (4) the availability of ground water. The atlas is one in a series on the several river basins in southeastern Michigan.

PHYSICAL DESCRIPTION

The River Raisin basin, an area of 1,072 square miles, is characterized by hilly to moderately undulating topography in the western and northwestern parts and by relatively flat terrain in the southeast. The two topographically different areas are divided by a series of ancient beaches that cross the basin in a southwest to northeast direction. These beaches, formed by glacial lakes, are marked by a local steepening of the land surface. Sands and clays laid down in the glacial lakes make up the surface deposits in the southeastern part of the basin. Areas to the northwest are underlain principally by moraine deposits.

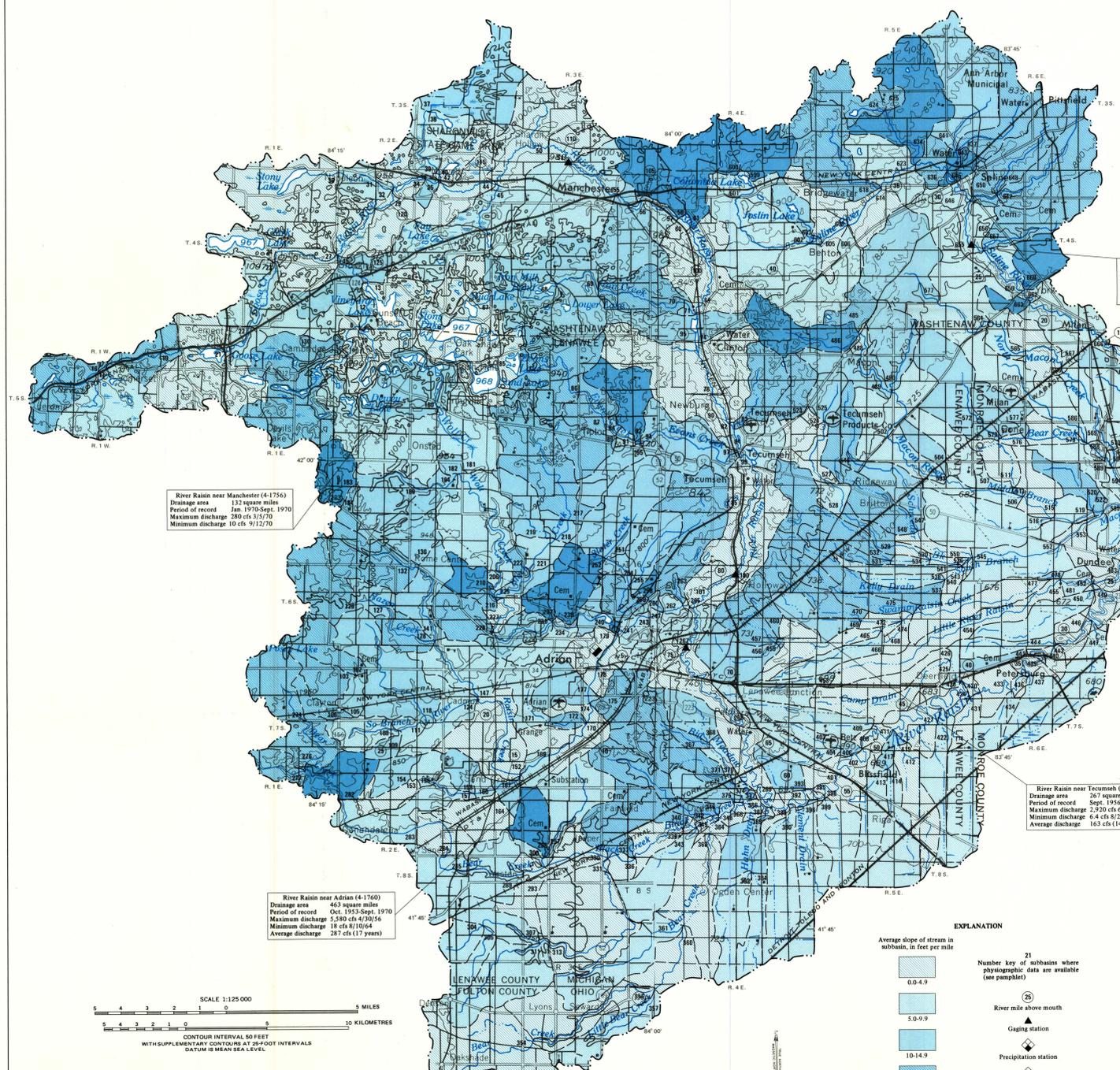
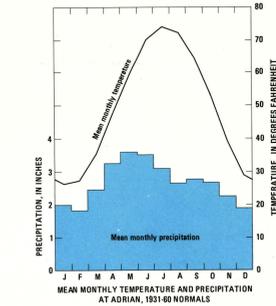
CLIMATE

The southeasterly location of the River Raisin basin in Michigan lessens the influence of Lake Michigan on the basin's climate, but the nearness of Lake Erie has some effect particularly when winds are from the east. Winds from the south or southwest pass over long distances of land surface unaffected by lake waters, and winds from these directions give the basin a continental climate. Based on records at Adrian, near the center of the basin, the mean annual temperature for the basin is about 10°C (50°F). Temperatures reach zero degrees Fahrenheit or lower on an average of 4 days each year, with one out of five winters experiencing no zero readings. At the other extreme, 38°C (100°F) or higher is recorded in one summer out of two, and days with 32°C (90°F) or above average 22 days. The average frost-free season extends from May 5 to October 10. Precipitation averages about 32 inches annually. About 58 percent of the precipitation occurs during the growing months April to September. May is the month of greatest precipitation, averaging about 3.6 inches; February is the month of least precipitation, averaging about 1.8 inches. Snowfall totals about 28 inches during an average winter.

There are 429 lakes and ponds in the River Raisin basin, ranging in size from 800 acres (Columbia Lake, an artificial lake) to less than an acre (Humphreys and Green, 1962, Michigan Lakes Inventory Bulletins 30, 38, 46, 58, and 61). Most lakes are in the moraine and outwash areas to the west and northwest. Elsewhere, lakes are widely scattered and generally small in size.

POPULATION AND ECONOMY

The population of the River Raisin basin is primarily urban and suburban, however, a significant part of the population is rural. Although most communities in this part of the basin are within an area of intensifying population growth, Adrian and Monroe are the largest cities with 1970 populations of 20,382 and 23,894, respectively. Other towns in the basin have populations of less than 10,000. The economy is highly diversified and includes manufacturing, industrial, and agricultural activities. Industrial activities include fabrication of metal products, machinery, and transportation equipment; manufacturing of paper and paper products, furniture, and chemicals; food processing, dairy related industries, and production of petroleum, natural gas, sand, gravel, limestone, and sandstone. Many industrial works are related to automobile manufacturing. Many agricultural products, chief among which are corn, winter wheat, soybeans, sugar beets, potatoes, oats, cabbage, and tomatoes, are raised in the basin. Monroe and Leavenworth Counties, which include a major part of the basin, are among the top 10 counties in Michigan in agricultural production. Cattle raising and dairy farming also add to the basin's economy.



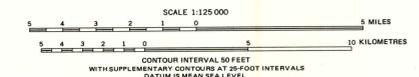
River Raisin near Manchester (4-1756)
Drainage area 132 square miles
Period of record Oct. 1970-Sept. 1970
Maximum discharge 280 cfs 3/5/70
Minimum discharge 10 cfs 9/12/70

Saline River near Saline (4-1764)
Drainage area 94.4 square miles
Period of record Oct. 1965-Sept. 1970
Maximum discharge 3,990 cfs 6/26/68
Minimum discharge 5.4 cfs 8/9, 12/66
Average discharge 63.8 cfs (5 years)

River Raisin near Monroe (4-1765)
Drainage area 1,042 square miles
Period of record Sept. 1937-Sept. 1970
Maximum discharge 12,006 cfs 5/19/45, 3/29/50
Minimum discharge 2 cfs 9/4/38, 9/19, 20/41
Average discharge 680 cfs (53 years)

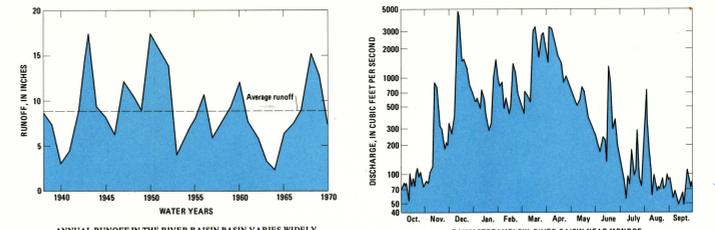
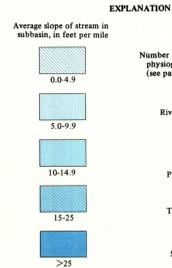
River Raisin near Tecumseh (4-1757)
Drainage area 267 square miles
Period of record Sept. 1936-Sept. 1970
Maximum discharge 3,230 cfs 6/26/64
Minimum discharge 6.4 cfs 8/26/64
Average discharge 163 cfs (14 years)

River Raisin near Adrian (4-1760)
Drainage area 463 square miles
Period of record Oct. 1953-Sept. 1970
Maximum discharge 5,380 cfs 8/20/56
Minimum discharge 18 cfs 8/10/64
Average discharge 287 cfs (17 years)



THE RIVER RAISIN BASIN IS CHARACTERIZED BY MODERATELY HILLY TOPOGRAPHY TO THE WEST AND NORTHWEST AND BY A RELATIVELY LEVEL LAND SURFACE TO THE SOUTHEAST

Stream gradients are relatively steep near the western and northern basin divide and in the central part of the basin where stream flow from the moraine and outwash areas in the northwest to the lake-bed areas in the southeast. Stream gradients near the southern basin divide and along the lower reaches of the River Raisin are relatively flat.

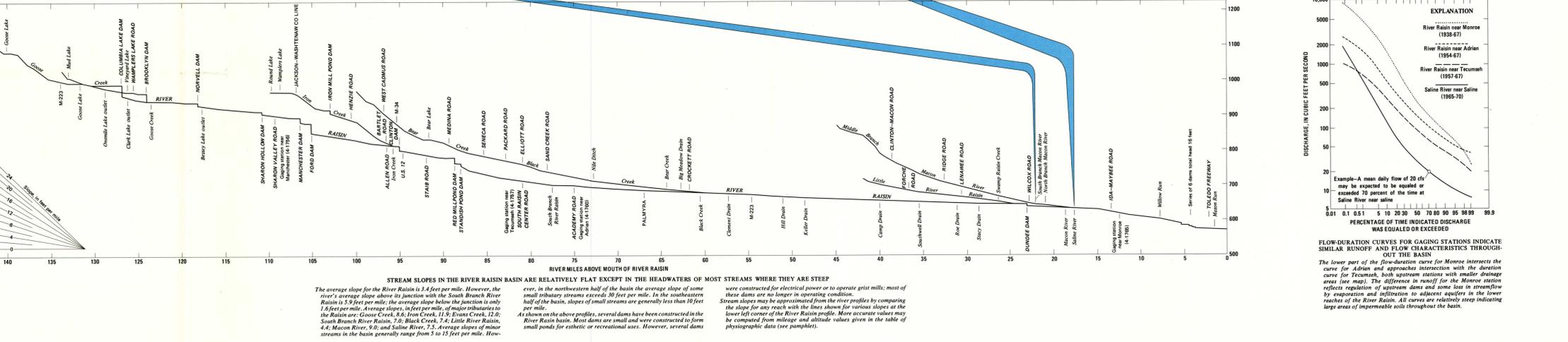
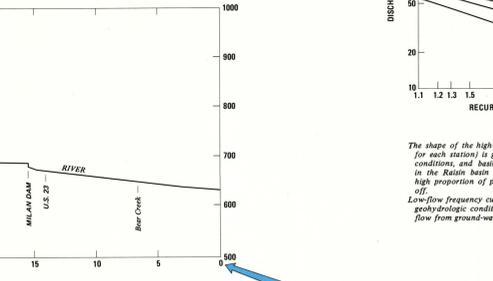
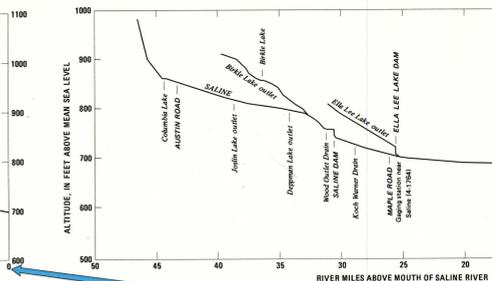
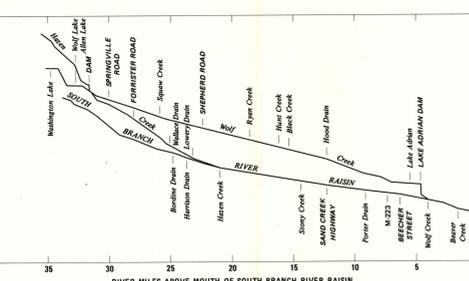
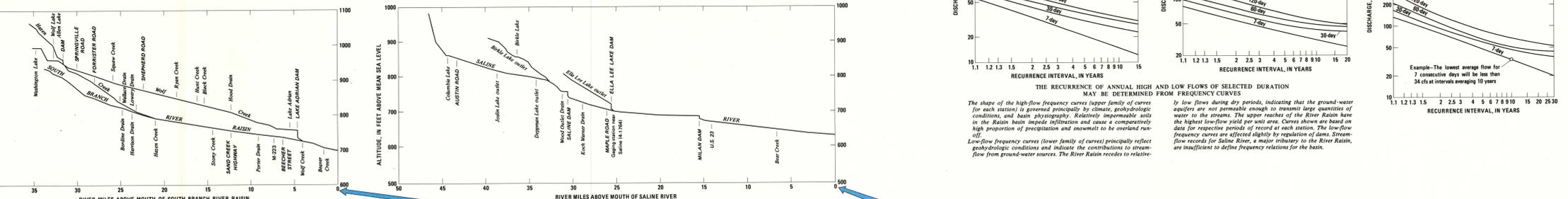


ANNUAL RUNOFF IN THE RIVER RAISIN BASIN VARIES WIDELY FROM YEAR TO YEAR

Runoff at the gaging station on the River Raisin at Monroe ranged from 22.91 inches in 1950 to 2.22 inches in 1964. Variations in runoff generally follow precipitation patterns, but the relationship is complex, depending upon the cumulative effect of precipitation and other factors. For example, the below normal precipitation beginning in 1961 culminated in the low runoff of 1964. Conversely, but less dependent upon successive year precipitation, above-normal precipitation in 1943 and 1950 resulted in the unusually high runoff for those years.

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. Day-to-day variations from the general pattern are caused by other climatic influences. Compact soils with low infiltration rates (see sheet 2) result in rapid increases in streamflow after periods of rain or snowmelt. Resultant peak discharges, however, are short-lived and streamflow quickly returns to lower discharges and base-flow conditions.



STREAM SLOPES IN THE RIVER RAISIN BASIN ARE RELATIVELY FLAT EXCEPT IN THE HEADWATERS OF MOST STREAMS WHERE THEY ARE STEEP

The average slope for the River Raisin is 3.4 feet per mile. However, the river's average slope above its junction with the South Branch River Raisin is 5.9 feet per mile; the average slope below the junction is only 1.6 feet per mile. Average slopes in feet per mile of major tributaries to the Raisin are: Goose Creek, 8.6; Iron Creek, 11.9; Evans Creek, 12.0; South Branch River Raisin, 7.0; Black Creek, 7.4; Little River Raisin, 6.4; Macon River, 5.0; and Saline River, 2.5. Average slopes of minor streams in the basin generally range from 5 to 15 feet per mile. However, these dams are no longer in operating condition. Stream slopes may be approximated from the river profiles by comparing the slope for any reach with the lines shown for various slopes at the lower left corner of the River Raisin profile. More accurate values may be computed from mileage and altitude values given in the table of physiographic data (see pamphlet).

WATER RESOURCES OF THE RIVER RAISIN BASIN, SOUTHEASTERN MICHIGAN

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