

INTRODUCTION

PURPOSE AND SCOPE

The purpose of this report is to describe the physical environment, availability, distribution, characteristics, movement, quality, water problems, and use of water within the Rock-Fox River basin in order to aid in planning future water management within the basin. This report presents general information on the basin that was derived from data obtained from Federal, State, and local agencies. In addition, new data were collected from areas where available data were scarce. The reader is referred to the section entitled "Agencies Having Additional Information" and to the list of selected references (sheet 4) for sources of more detailed information.

This atlas is one of a series of 12 river-basin studies designed to describe in general terms the water resources of the State. More detailed studies of problem areas will be required in the future as the need for additional information increases.

LOCATION AND EXTENT

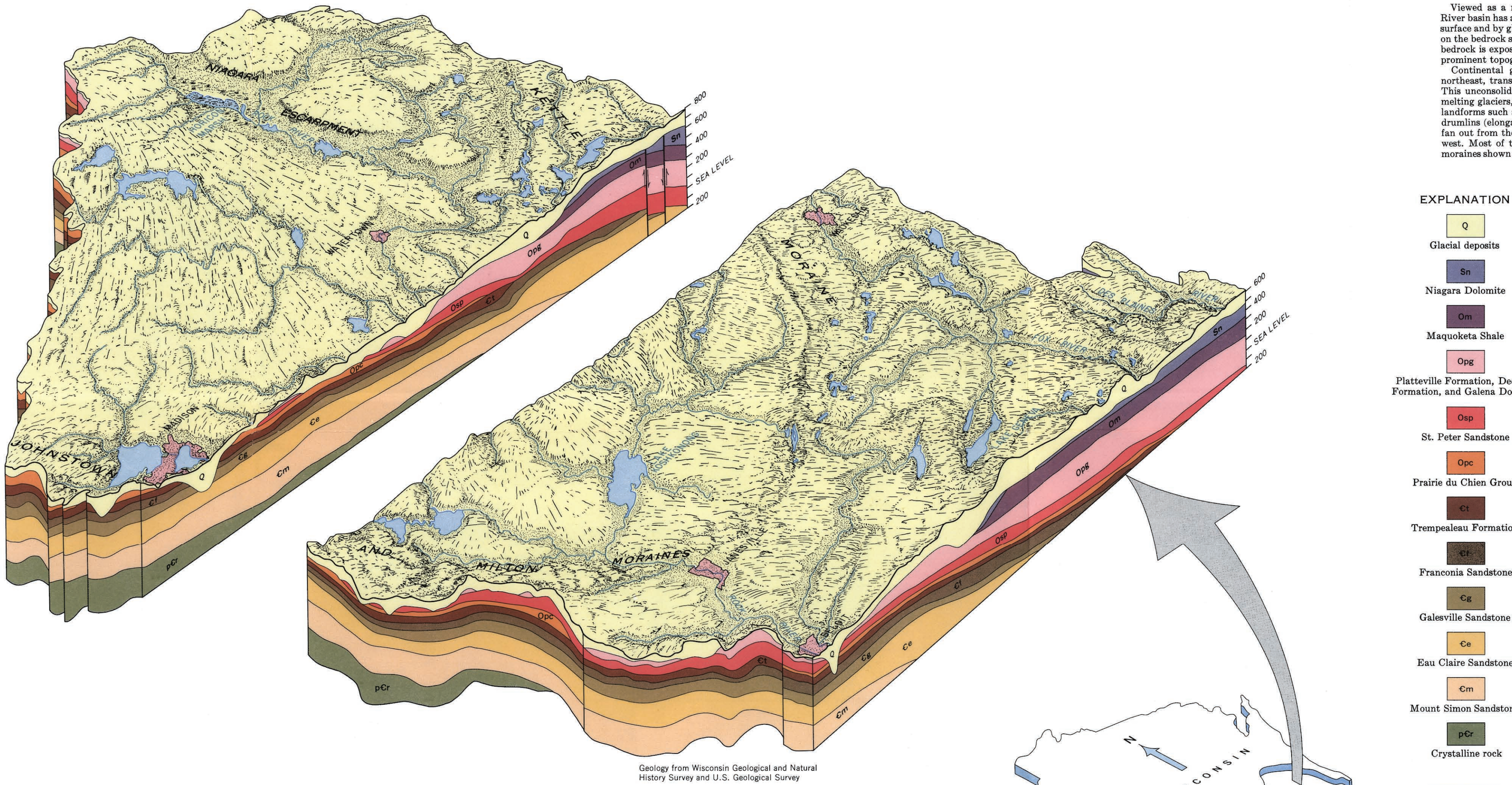
The Rock-Fox River basin in Wisconsin, covers about 4,750 square miles in the southeastern part of the State. It includes all or parts of the following 19 counties: Columbia, Dane, Dodge, Fond du Lac, Green Lake, Jefferson, Kenosha, Milwaukee, Racine, Rock, Walworth, Washington, and Waukesha. It includes the area drained by the Rock, Fox, and Des Plaines Rivers within the State of Wisconsin.

Although the basin boundary is the topographic divide, part of the streamflow is derived from ground water that drains from an area similar to, but not having the same boundaries as, the topographic basin. The ground-water basin covers about 4,550 square miles, 400 square miles less than the topographic basin. Most of the reduction in basin area is along the eastern side of the basin.

ACKNOWLEDGMENTS

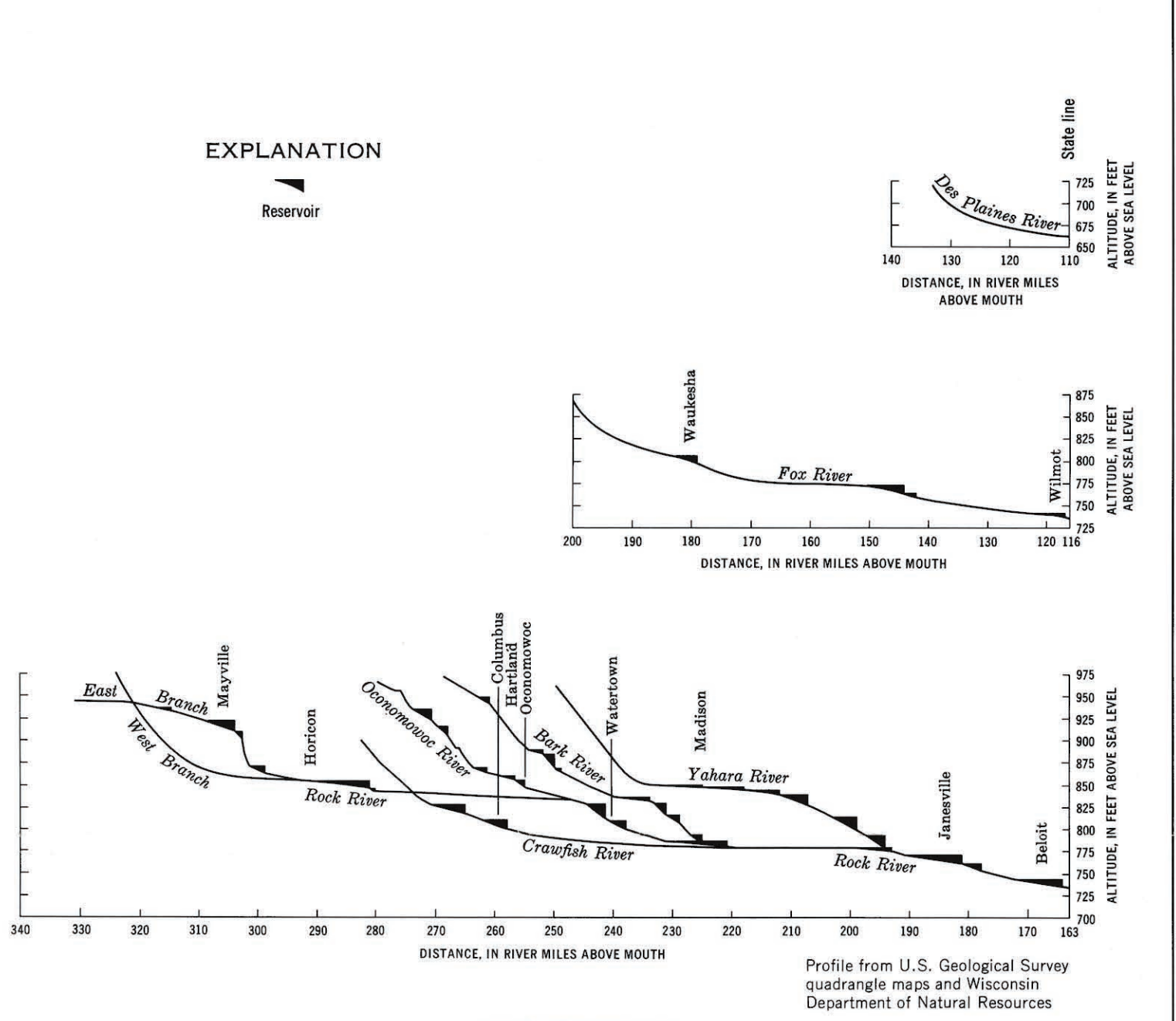
Much data was supplied by State agencies. University Extension—The University of Wisconsin Geological and Natural History Survey furnished well logs and geologic and soils maps. Chemical analyses and water-use data were obtained from the Wisconsin Department of Natural Resources and from the Public Service Commission of Wisconsin. Municipal officials, county agricultural agents, and U. S. Soil Conservation Service personnel also supplied valuable information.

PHYSICAL SETTING



BLOCK DIAGRAM OF THE ROCK-FOX RIVER BASIN

TOPOGRAPHY AND DRAINAGE



STREAM PROFILES

The Rock-Fox basin has a rolling topography and rather low relief—ranging from 664 feet above sea level on the Des Plaines River at the State line to 1,325 feet on a hilltop 5 miles southeast of Hartford. The topography is the result of bedrock and glacial deposits and of streams that cut into these formations to form the present river drainage system. The topography is also modified by man's use of the land and water resources.

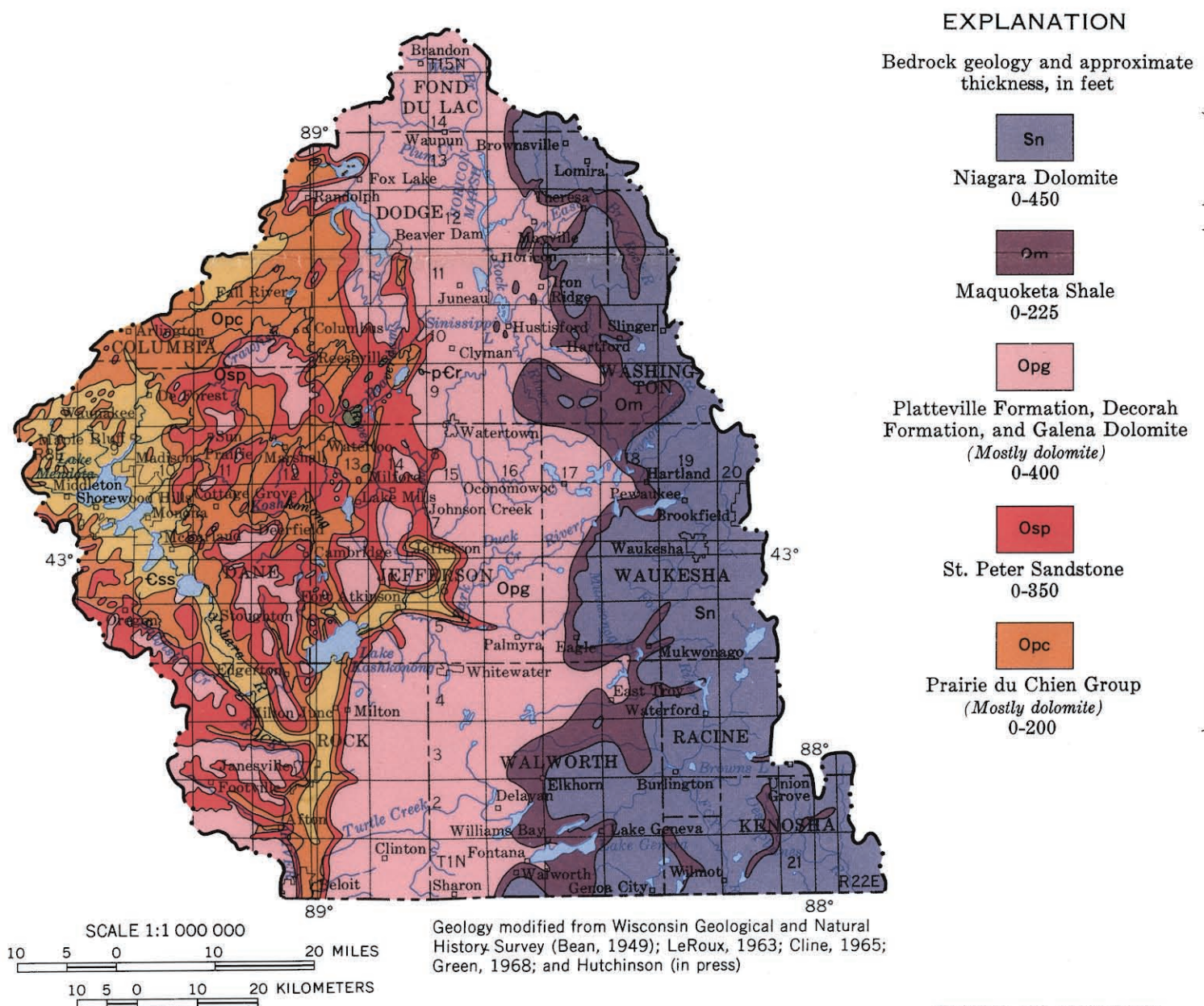
The rivers have relatively low gradients except in their headwaters. The gradient of the Rock River between Horton and the State line averages only about 1 foot per mile; the Fox River has a similar gradient. In the Yahara River the stream gradient between Madison and Stoughton is less than 1 foot per mile across a chain of lakes developed behind an end moraine. An exception to streams having steep gradients in their headwaters is the East Branch of the Rock River where the stream is underlain by shale. The steep slopes of the Rock and Fox Rivers between an altitude of about 780 and 830 feet are probably a reflection of the slope of the underlying bedrock valley, which has cut into the easily eroded St. Peter and Cambrian sandstones in this reach after crossing the more resistant dolomite of the Plattville-Galena unit.

LAND USE

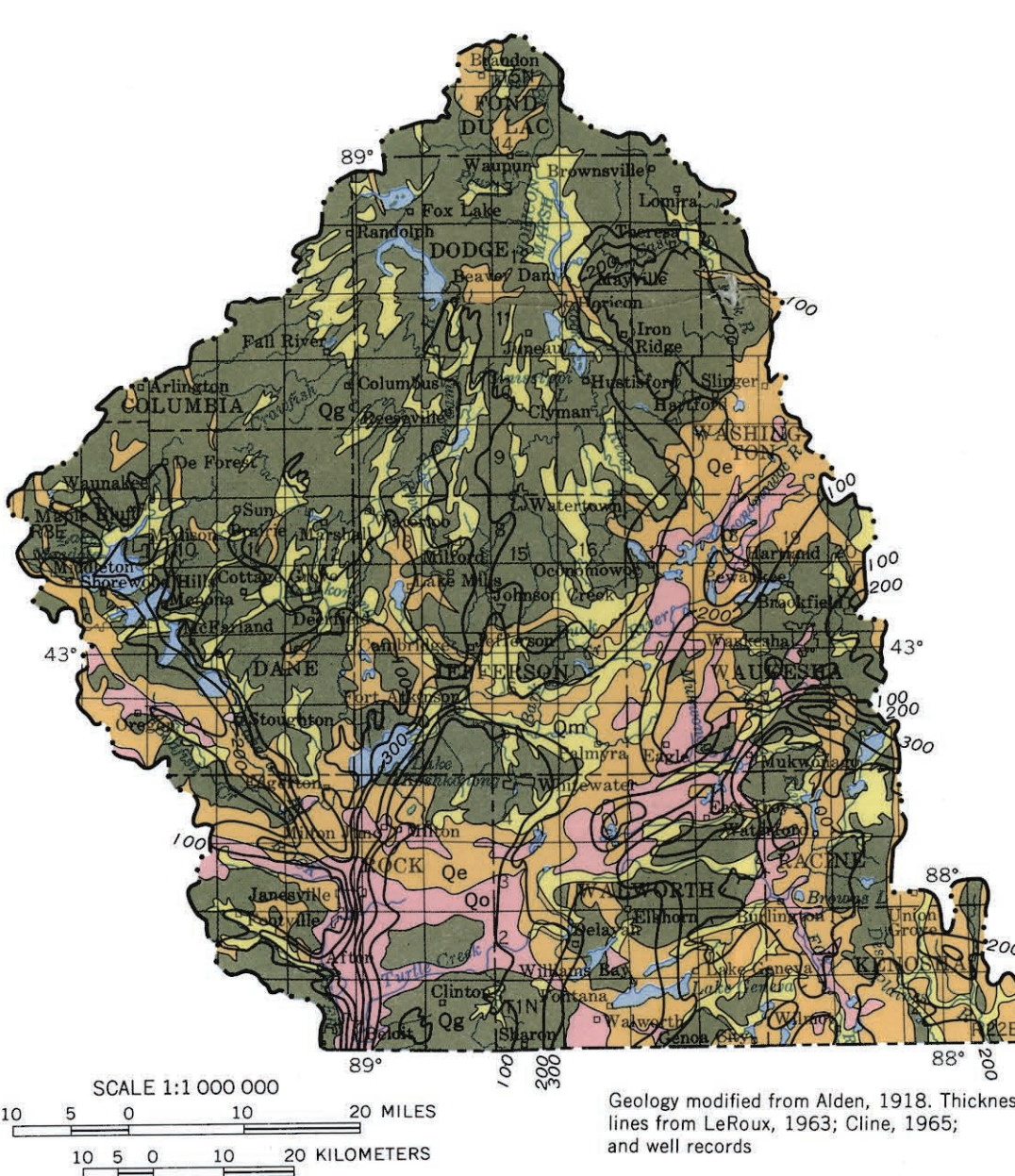
The Rock-Fox River basin area is about 97 percent land and 3 percent water. About 66 percent is in agriculture, 10 percent urban or built up, 8 percent in private, State, and Federal forests, and 13 percent "other land," which includes various county-owned lands and ungrazed marshlands.

(Personal communication, U.S. Dept. of Agriculture, Soil Conservation Service.)

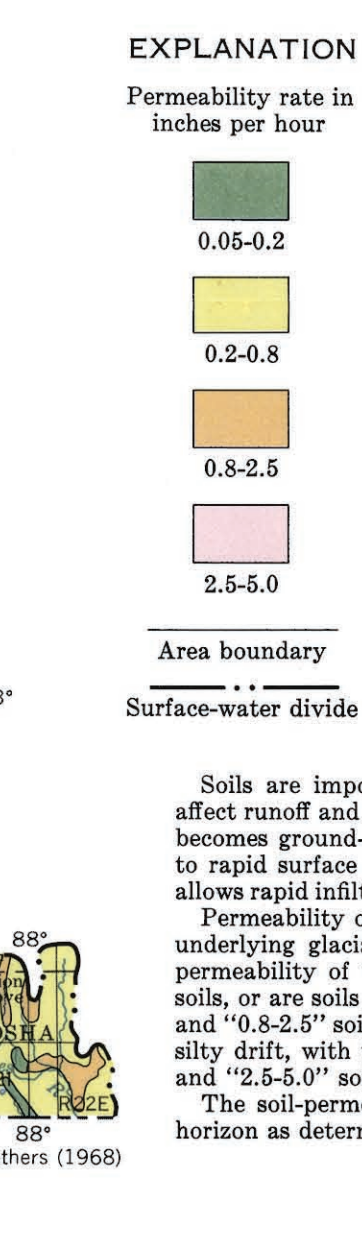
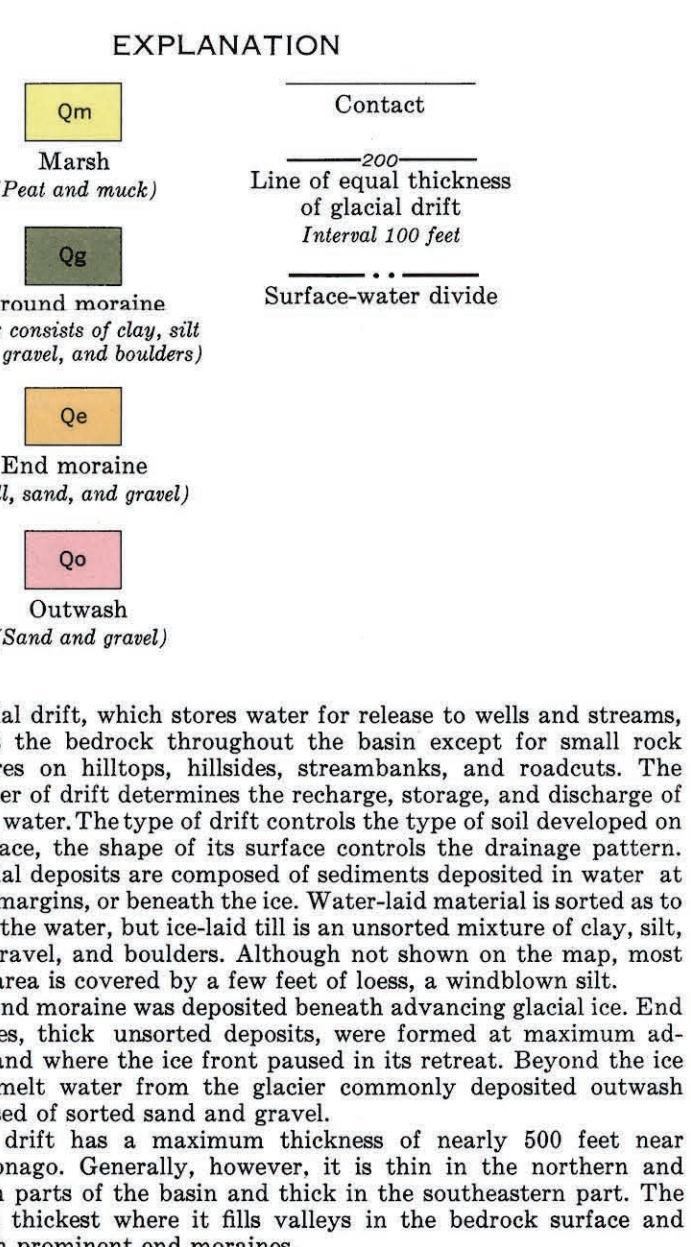
GEOLOGY AND SOILS



BEDROCK GEOLOGY

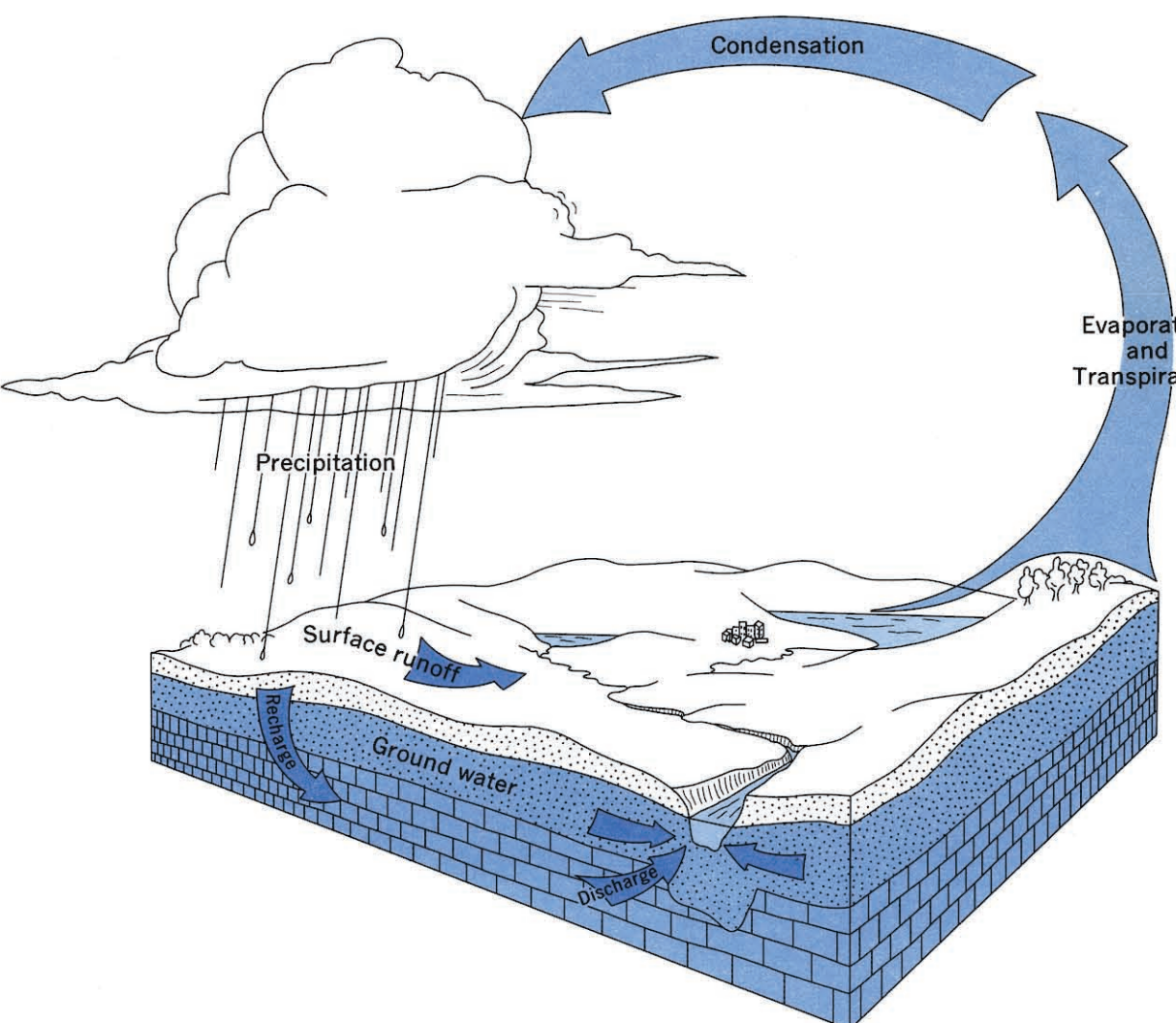


GLACIAL GEOLOGY



SOIL PERMEABILITY

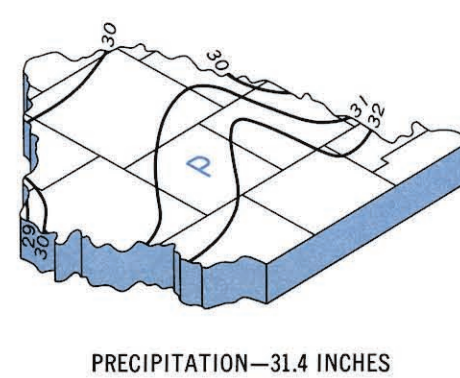
WATER CYCLE



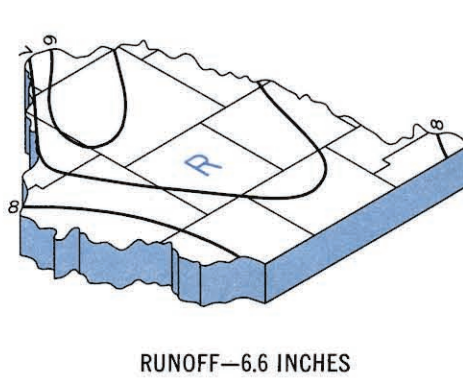
Precipitation, the source of all water in the basin, falls on the land surface, streams, and lakes and commences the cycle of circulation called the water cycle. Some of the water runs rapidly off the land surface to nearby streams and lakes (surface runoff); some water evaporates immediately from the surface soil and plants (evaporation); some water enters the soil and is transpired by plants (transpiration); and some water seeps down through the soil, eventually recharging the ground-water reservoir (recharge) and contributing

base flow to streams and lakes (discharge). Ground water also discharges through pumping wells.

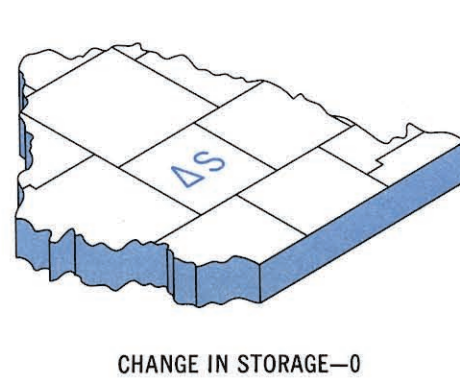
The cycle may not be complete within an area as small as a river basin; usually large parts of the earth are involved. Within the Rock-Fox River basin most precipitation results from storms from the west and southwest, and moisture returned to the atmosphere leaves the basin on winds from the same direction.



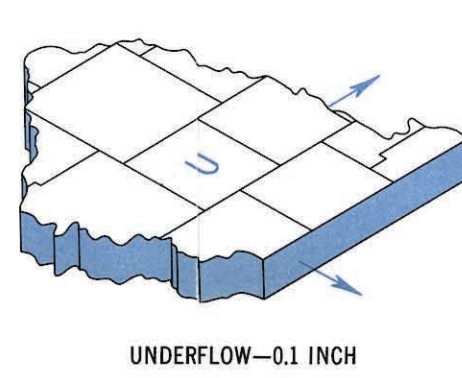
PRECIPITATION—31.4 INCHES



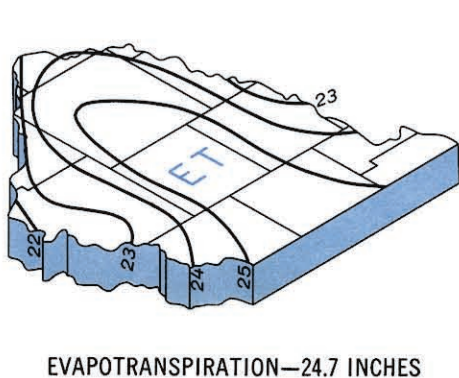
RUNOFF—6.6 INCHES



CHANGE IN STORAGE—0



UNDERFLOW—0.1 INCH



EVAPOTRANSPIRATION—24.7 INCHES

The average annual precipitation is 31.4 inches, based on U.S. Weather Bureau records for the period 1931-60. Precipitation is greatest in the southern part of the basin (more than 32 inches) and least in the northern and northeastern parts (less than 30 inches).

Average annual runoff leaving the basin is 6.6 inches. This figure was computed from gaging-station records on the Rock, Fox, and Des Plaines Rivers for the period 1931-60. Runoff is least in the northern part of the basin (less than 6 inches), primarily because precipitation is low (less than 31 inches). It is greatest in the western and southeastern parts of the basin (more than 8 inches) because of higher precipitation (more than 32 inches).

The amount of water stored in lakes and reservoirs, in the soil zone, or in the ground-water reservoir may increase or decrease over a given year. However, the net change is negligible (assumed equal to zero) when averaged over the 30-year period of this budget.

The total amount of water in storage in the Rock-Fox basin is more than 1,000 inches, of which less than 5 inches are in lakes and streams; the remainder is stored underground.

The water budget of the Rock-Fox River basin is a quantitative statement of the balance between the total water gains and losses of the basin for a period of time. The average annual water budget for a 30-year period (1931-60) shows that of the 31.4 inches of precipitation entering the system, only 6.6 inches is available for man's use. The total amount of water in storage in the Rock-Fox basin is more than 1,000 inches, of which less than 5 inches are in lakes and streams; the remainder is stored underground.

The quantities of these budget items fluctuate from year to year. Underflow remains fairly constant, changes in storage and evapotranspiration fluctuate somewhat, but proportionately, precipitation and runoff show the greatest changes.

In 1964, a dry year, basin precipitation was only about 25 inches, runoff was about 5.4 inches, and the amount of water in storage continued to decline from 1963 when precipitation was only about 24 inches.

Underflow is that water entering or leaving the basin through the ground-water reservoir. No significant underflow enters the basin. About 6 mgd leaves the basin to the south, largely within the glacial outwash of the Rock River valley; and about 10 mgd leaves the basin to the east, within the sandstone aquifer. At this rate, about 0.1 inch of underflow leaves the basin each year.

Evapotranspiration is the return of water to the atmosphere by a combination of evaporation from open water, foliage surfaces, and the land surface, and transpiration from plants. Average annual evapotranspiration is estimated to be 24.7 inches, which is the difference between precipitation and the sum of runoff, changes in storage, and underflow. Evapotranspiration is greatest in the central part of the basin, where precipitation is highest and where wetlands and shallow water tables are common; it is least in the hilly western and eastern parts of the basin.

WATER RESOURCES OF WISCONSIN—ROCK-FOX RIVER BASIN

By
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