DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

PREPARED IN COOPERATION WITH THE
COMMONWEALTH OF MASSACHUSETTS
WATER RESOURCES COMMISSION
AND BERKSHIRE COUNTY

HYDROLOGIC INVESTIGATIONS
ATLAS HA-481 (SHEET 1 OF 2)

INTRODUCTION

PURPOSE AND SCOPE

The purpose of this atlas is to provide information on the quantity, quality, and availability of water in that part of the Hoosic River basin located in Massachusetts. The investigation was made by the U.S. Geological Survey in cooperation with the Commonwealth of Massachusetts, Department of Natural Resources, as part of a statewide program of river basin studies. This report is intended as an aid to planners of future water-resources development and management.

LOCATION AND DESCRIPTION

The Hoosic River has its headwaters in northwestern Massachusetts and southern Vermont and flows northwestward through southern Vermont into New York, where it is tributary to the Hudson River. Upstream from the Massachusetts State line it drains a total of 205 square miles of which 164 square miles are in Massachusetts, 39 square miles in Vermont, and 2 square miles in New York. The basin has relatively high relief, with elevations ranging from 3,487 feet on Mt. Greylock, the highest point in Massachusetts, to about 560 feet at the State line.

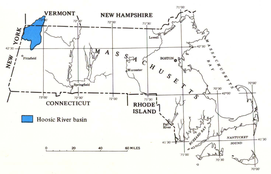
Deep bedrock valleys along the main stem have been filled with more than 300 feet, in places, of glacial lake sediments and outwash deposits, which form the main ground-water reservoirs in the basin. Higher elevations expose the bedrock or are covered with varying thicknesses of glacial till.

Drainage is in well-defined channels. The natural regimen along the main stem has been altered by Cheshire Reservoir and construction of flood control structures in Adams and North Adams.

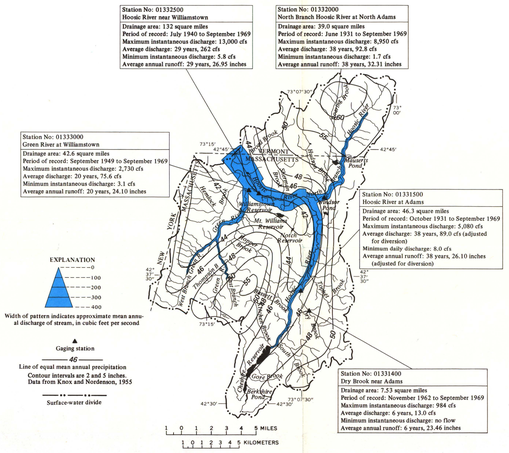
ACKNOWLEDGMENTS

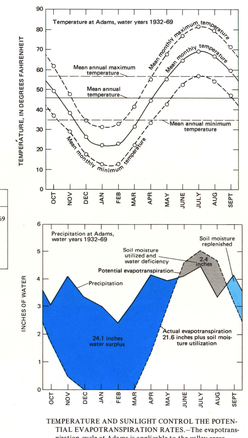
Assistance and information in the form of well logs, water-level data, chemical data, and water-use data supplied by the Massachusetts Department of Public Works, town officials, local well drillers, and individuals is gratefully acknowledged. Other agencies and organizations supplying information are U.S. Army Corps of Engineers, Environmental Protection Agency, Massachusetts Department of Public Health, and Berkshire County Regional Planning Commission.

Field data collected for this report during 1967–69 included low-flow measurements, sediment discharge, chemical analyses, water-level measurements, and well logs, are available from the U.S. Geological Survey, 150 Causeway Street, Boston, Mass. 02114.



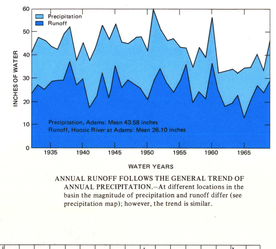
LOCATION OF STUDY AREA



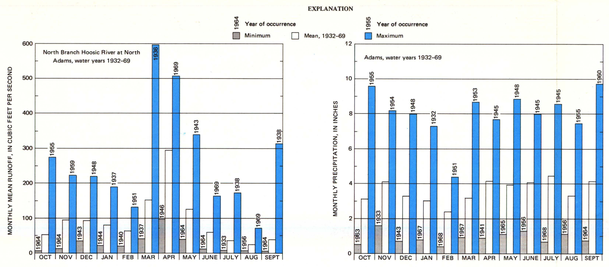


TEMPERATURE AND SUNLIGHT CONTROL THE POTENTIAL EVAPOTRANSPIRATION RATES.—The evapotranspiration cycle at Adams is applicable to the valley areas, whereas in the higher terrain where temperatures are lower and precipitation higher (see precipitation map), soil-moisture deficiencies will be lower.

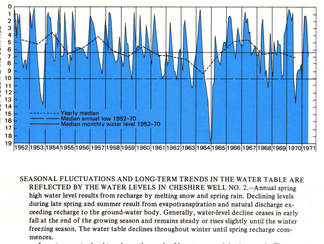
THE AMOUNT OF PRECIPITATION AND THE SIZE OF THE DRAINAGE AREA ARE THE TWO MOST IMPORTANT FACTORS INFLUENCING MEAN ANNUAL FLOW.—Mean flows at ungaged sites in New England are computed from Johnson's (1970) equation for sites greater than 10 square miles.



ANNUAL RUNOFF FOLLOWS THE GENERAL TREND OF ANNUAL PRECIPITATION.—At different locations in the basin the magnitude of precipitation and runoff differ (see precipitation map); however, the trend is similar.



SNOWMELT IN SPRING AND EVAPOTRANSPIRATION IN SUMMER AND FALL CAUSE ANNUAL CYCLICAL TRENDS IN RUNOFF, EVEN THOUGH PRECIPITATION IS EVENLY DISTRIBUTED THROUGHOUT THE YEAR.



SEASONAL FLUCTUATIONS AND LONG-TERM TRENDS IN THE WATER TABLE ARE REFLECTED BY THE WATER LEVELS IN CHESHIRE WELL NO. 2.—Annual spring high water level results from recharge by melting snow and spring rain. Declining levels during late spring and summer result from evapotranspiration and natural discharge exceeding recharge to the ground-water body. Generally, water-level decline ceases in early fall at the end of the growing season and remains steady or rises slightly until the winter freezing season. The water table declines throughout winter until spring recharge commences.

Long-term water-level trends are the result of long-term precipitation trends. The trend reached a low in 1964, which was considered the height of a drought in this area.

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_____1965b, Preliminary materials map, Windsor quadrangle, Massachusetts: U.S. Geol. Survey open-file rept.
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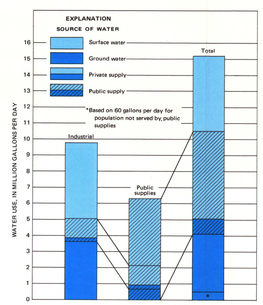
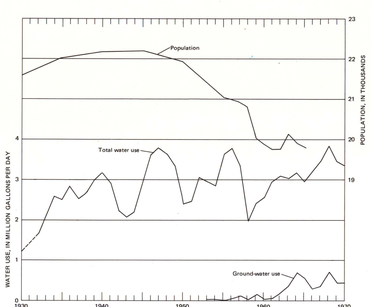
WATER USE



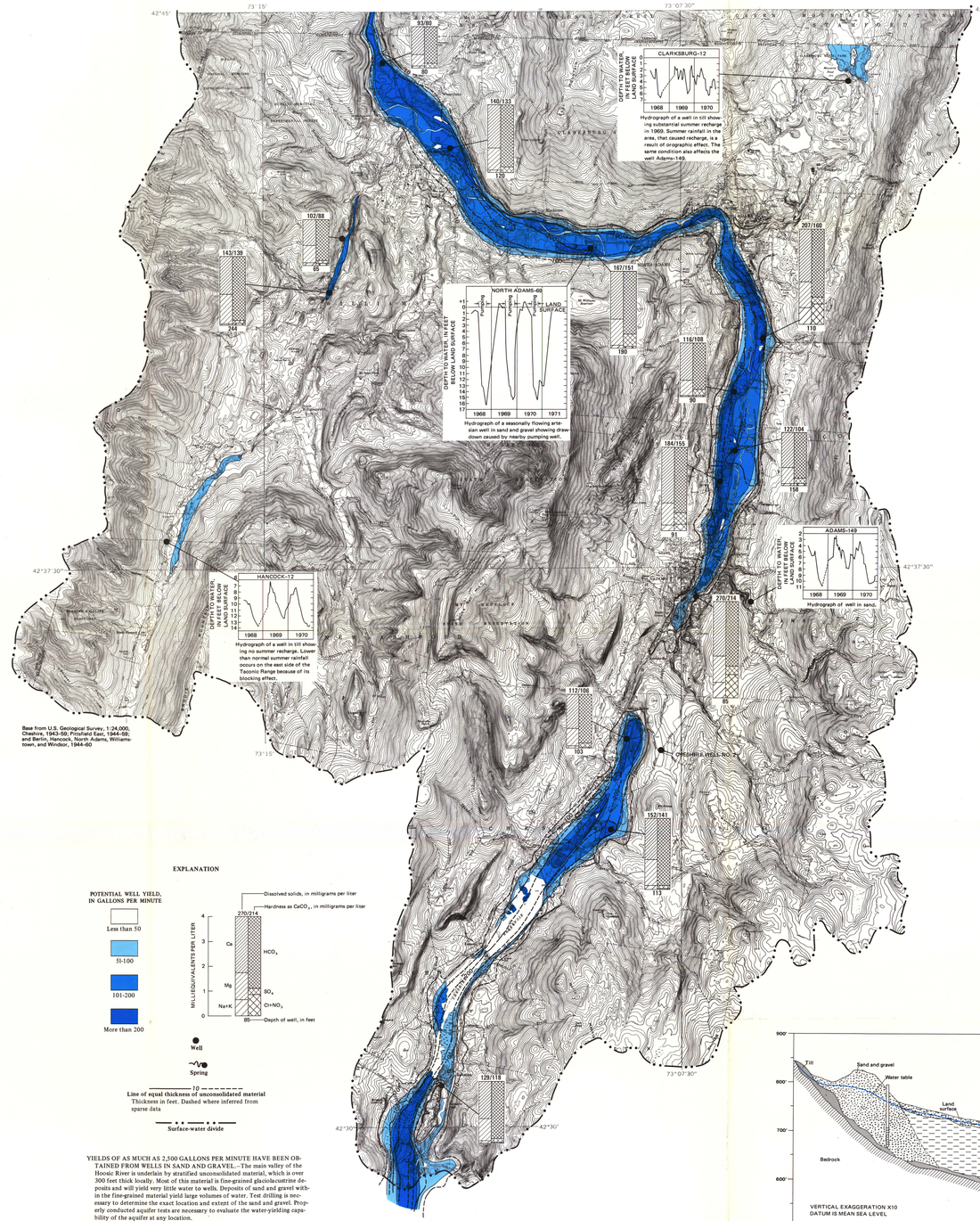
TOTAL WATER USE IN THE BASIN WAS 15.3 MILLION GALLONS PER DAY.—Usage was 66 percent surface water and 34 percent ground water. Industrial use was 64 percent and domestic use was 36 percent of the total.



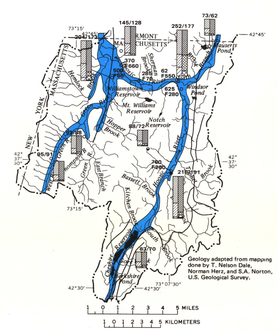
WATER USE FOR NORTH ADAMS HAS RANGED FROM 2 TO 3.8 MILLION GALLONS PER DAY SINCE 1935.—Since 1935 water use has varied generally in response to short-term precipitation trends; periods of lower precipitation result in higher water use. Population decline since 1945 has been compensated by increased per capita use.

GROUND-WATER AVAILABILITY AND QUALITY

UNCONSOLIDATED AQUIFERS



CONSOLIDATED AQUIFERS



Geology adapted from mapping done by T. Nelson Dale, Norman Herz, and S.A. Norton, U.S. Geological Survey.

EXPLANATION

Areas favorable for developing 50 gallons per minute or more from carbonate rock

Well developed in carbonate rock
Top number indicates depth of well, in feet below land surface. Bottom number indicates pumped yield of well, in gallons per minute.
Prefix (P) indicates that the well flowed

Well developed in schist or quartzite

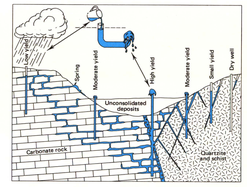
Spring

Dissolved solids, in milligrams per liter
Hardness as $CaCO_3$, in milligrams per liter
MILLIEQUIVALENTS PER LITER
204/173
Ca
Mg
Na+K
HCO_3
SO_4
Cl+NO_3

Fault zones

Surface-water divide

AREAS FAVORABLE FOR OBTAINING LARGE QUANTITIES OF WATER FROM BEDROCK ARE UNDERLAIN BY CARBONATE ROCK (LIMESTONE AND DOLOMITE) AND CORRESPOND TO TOPOGRAPHIC LOWS.—Fractured and faulted zones in any rock type may be favorable for higher than average yields. The dissolved solids are predominantly calcium and magnesium bicarbonate, the principal constituents of limestone.



WATER IS OBTAINED FROM SECONDARY OPENINGS, SUCH AS FRACTURES AND JOINTS IN SCHIST AND QUARTZITE AND, IN ADDITION, FROM SOLUTION CAVITIES IN LIMESTONE.—Increased fracturing along fault zones may provide higher yield to wells. The high-yielding solution cavities in carbonate rocks are usually larger and more numerous near faults and along geologic contacts. Artesian conditions occur when a well taps an aquifer in which water is confined under hydrostatic pressure.

Springs rise where water, under hydrostatic pressure, in the bedrock aquifers makes its way through fissures or solution openings in the rocks, either laterally or upward, to the land surface.

EXPLANATION

POTENTIAL WELL YIELD, IN GALLONS PER MINUTE
Less than 50
51-100
101-200
More than 200

Dissolved solids, in milligrams per liter
Hardness as $CaCO_3$, in milligrams per liter
270/214
MILLIEQUIVALENTS PER LITER
Ca
Mg
Na+K
HCO_3
SO_4
Cl+NO_3
85
Depth of well, in feet

Well

Spring

10
Line of equal thickness of unconsolidated material
Thickness in feet. Dashed where inferred from sparse data

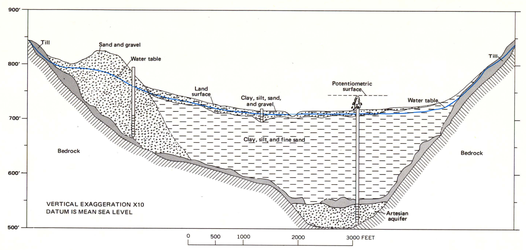
Surface-water divide

YIELDS OF AS MUCH AS 2,500 GALLONS PER MINUTE HAVE BEEN OBTAINED FROM WELLS IN SAND AND GRAVEL.—The main valley of the Hoosic River is underlain by stratified unconsolidated material, which is over 300 feet thick locally. Most of this material is fine-grained glaciolacustrine deposits and will yield very little water to wells. Deposits of sand and gravel within the fine-grained material yield large volumes of water. Test drilling is necessary to determine the exact location and extent of the sand and gravel. Properly conducted aquifer tests are necessary to evaluate the water-yielding capability of the aquifer at any location.

In general, the tributary streams are underlain by only thin deposits of sand and gravel on till and bedrock. At higher elevations, bedrock may crop out or may be covered by various thicknesses of till (heterogeneous mixture of clay, silt, sand, gravel and boulders), which yields only small quantities of water sufficient for domestic use.

The dissolved solids in the water are everywhere characterized by a predominance of calcium and magnesium bicarbonate. This reflects the relatively higher solubility of the limestone fraction of the unconsolidated material.

SCALE 1:48 000
1 ½ 0 1 2 3 MILES
1 .5 0 1 2 3 4 5 KILOMETERS
CONTOUR INTERVALS 10 AND 20 FEET
DATUM IS MEAN SEA LEVEL



WATER IN SAND AND GRAVEL AQUIFERS OF THE HOOSIC RIVER VALLEY MAY BE UNDER EITHER WATER-TABLE OR ARTESIAN CONDITIONS.

Some unconsolidated deposits may be hydraulically connected to the carbonate bedrock aquifer that underlies most of the valley, which may result in artesian conditions. (See diagram showing occurrence of water in bedrock.) At a given location the unconsolidated units shown are not always present or in the same sequence shown by the generalized cross section.

HYDROLOGY AND WATER RESOURCES OF THE HOOSIC RIVER BASIN, MASSACHUSETTS

By
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1973

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