PREPARED IN COOPERATION WITH THE
IOWA GEOLOGICAL SURVEY

INTRODUCTION

The bedrock surface in Iowa is covered nearly everywhere by unconsolidated deposits of glacial drift and alluvium which range in thickness from less than 1 foot to more than 400 feet, and from less than 1 foot to about 60 feet, respectively. The bedrock surface is the result of a complex system of ancient drainage courses, which were developed during the long period of preglacial erosion and during shorter, but more intense, periods of interglacial erosion.

BEDROCK TOPOGRAPHY

Primary control for the map is log data and information from quarries and outcrops. Published data provide additional control, but information from the earlier literature (Norton, 1912) may not be as precise as the log data. Project data are information obtained during a well inventory in Decatur County. More detailed information about the control data is available in the cooperative files of the Iowa Geological Survey and the U. S. Geological Survey, Iowa City, Iowa.

The accuracy of the map is related to the density of control points; the greater number of points there are in a given area, the more exact is the placement of contours. In several instances dashed contours are used where it seems reasonable to continue a ridge or valley.

The bedrock topography of the map area reflects the erosional history of the bedrock surface and the lithology of the underlying rocks. South of U. S. Highway 34, deeply buried bedrock channels - most of which probably are preglacial - are the most conspicuous physical features. The channels are cut in bedrock that is dominantly shale, and characteristically are relatively wide with gently-sloping walls. These channels are the headward extensions of ancient bedrock drainage courses that continue into Missouri. Heim and Howe (1963) applied the names Albany Valley, Hatfield Valley, and Thompson River Valley to buried valleys in Missouri that originate in or cross the map area. In the present report the names Albany and Hatfield have been retained, but the name Decatur has been assigned in place of Thompson River. Also, in the present study, the term "channel" is used instead of "valley" to conform to general usage in Iowa reports.

North of Highway 34, Decatur Channel is a conspicuous bedrock feature, however, in most of this northern area the bedrock surface has been sculptured by present-day streams. Most of these streams have deeply incised the bedrock uplands and have extended their valleys by headward erosion. Generally, the bedrock-incised stream valleys are narrow and steep walled. This present-day drainage pattern is in marked contrast to the drainage south of Highway 34 where most stream valleys lie above the bedrock and where those valleys that have incised the bedrock usually are of limited extent. At some locations present-day streams have cut their valleys into the buried-channel bedrock with the result that the bedrock surface at these points of intersection is common to both the stream valleys and the buried channels. This is best exemplified by the intersection of the valleys of Middle and North Rivers with Decatur Channel in northwestern Warren County.

At numerous places where present-day streams have incised the bedrock surface, dissection of the bedrock is more advanced than is indicated by the map contours. The contours show the configuration of the bedrock surface along and adjacent to the principal streams and tributaries but they generally do not depict the dissection of the surface by minor streams. Therefore, to more precisely interpret the bedrock topography adjacent to principal stream valleys, the map user should refer to available U. S. Geological Survey topographic quadrangle maps for the locations and surface altitudes of streams not shown on this map.

USES OF MAP

The bedrock map, when used in conjunction with land-surface altitudes, is a vital tool for studying hydrologic, environmental, and geologic problems.

Hydrology. – The map is an aid in locating supplies of ground water. The appraisal of availability of supplies in the map area is based principally on data from 713 test borings drilled during a cooperative U. S. Geological Survey and Iowa Geological Survey water-resources investigation in nine of the 11 counties. These data indicate a relationship between the physical features of the bedrock surface and ground-water occurrence in the overlying unconsolidated deposits. The areas most favorable for the development of ground-water supplies are: (1) buried-bedrock channels and (2) alluvial valleys of present-day streams which may or may not have incised the bedrock.

Sand and gravel aquifers often are distributed irregularly and are not present at all places within the drift-filled bedrock channels; however, they do occur more frequently and are more extensive in areas underlain by bedrock channels than in areas underlain by bedrock uplands. Relatively few wells tap the deeper channel aquifers, but available drilling data indicate that individual wells tapping these deeper aquifers have yields generally ranging from 10 to 50 gpm (gallons per minute) and that local yields may be larger. Buried-bedrock channels often are the only source of potable water within 1,000 feet or more of the land surface because bedrock that is predominantly shale (Hershey, 1969) underlies most of the map area. To obtain maximum yields from channel aquifers a well should be drilled to bedrock to locate and develop all water-bearing sands and gravels.

Alluvial deposits have a maximum thickness of about 60 feet and contain sand and gravel aquifers that will yield from 10 to 50 gpm or more to individual wells. A well in the alluvium should tap the full saturated thickness of sands and gravels.

The map will help the drilling contractor when planning the construction of a well. By determining the depth to bedrock, the contractor can estimate casing needs and prepare more accurate cost estimates. And, where the overburden is particularly thick, the contractor can be better prepared for any problems attendant to drilling this material.

Other uses for the map are in river basin-hydrology studies and in determining surface-water and ground-water relationships at selected locations.

Environment. – The bedrock information is particularly valuable to state, regional, and local planners concerned with environmental problems such as the location of landfill sites. A knowledge of the thickness of overburden, which can be computed with the aid of this map, is important in determining whether ground-water supplies may be subject to potential contamination.

Geology. – The bedrock map shows the location of bedrock highs, which are of interest to quarry operators and to construction engineers concerned with foundation problems. The map also aids in the interpretation of drainage changes caused by glacial advances and in mapping the areal distribution of consolidated rocks.

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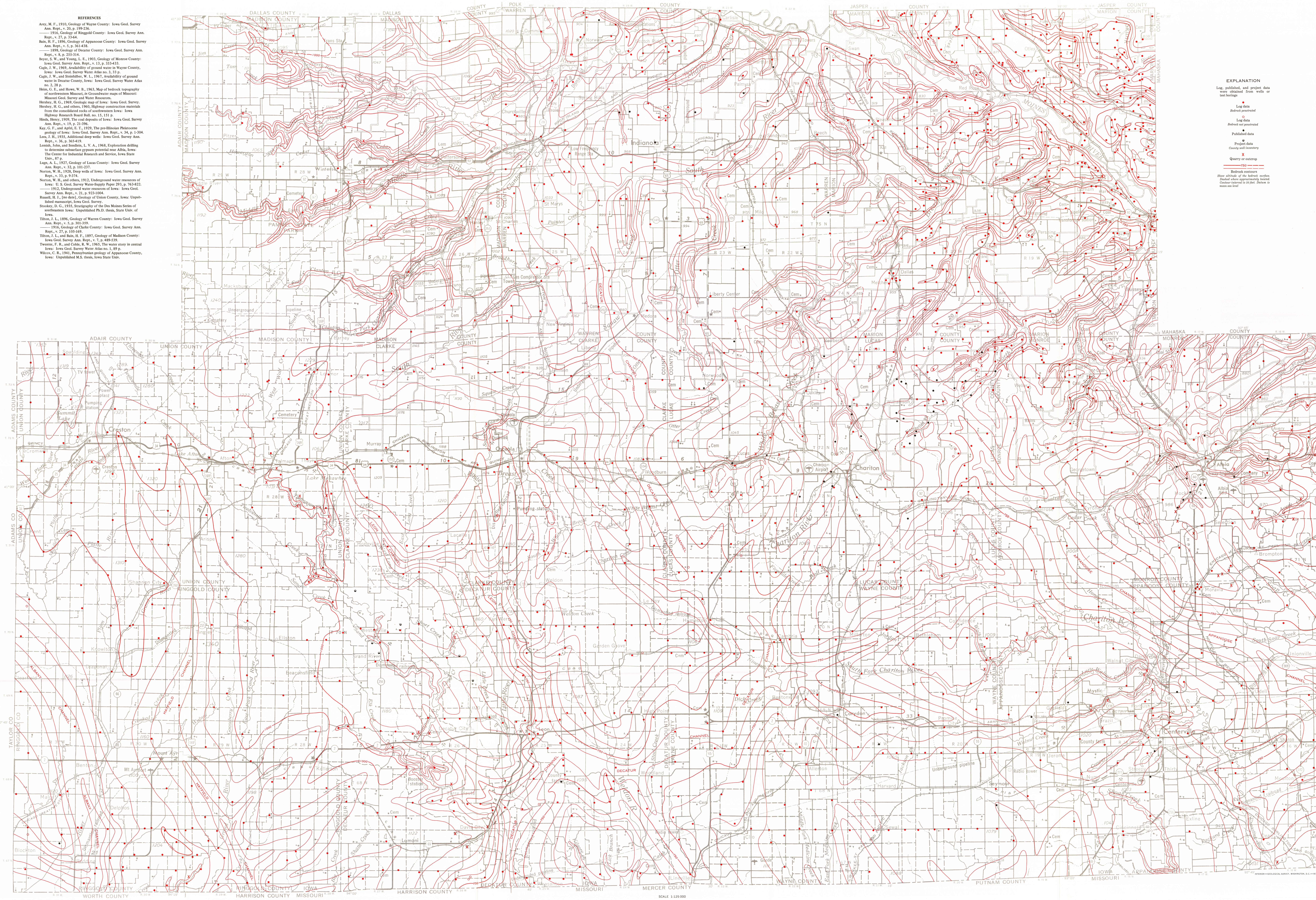

EXPLANATION

Log, published, and project data were obtained from wells or test borings

● Log data
Bedrock penetrated

○ Log data
Bedrock not penetrated

● Published data

◒ Project data
County well inventory

X Quarry or outcrop

———750 — — —
Bedrock contours
Show altitude of the bedrock surface. Dashed where approximately located. Contour interval is 50 feet. Datum is mean sea level

Base from U. S. Geological Survey 1:250,000 Centerville, Des Moines, Omaha, 1954, and Nebraska City, 1955

SCALE 1:125 000
2 0 2 4 6 8 10 MILES
2 0 2 4 6 8 10 KILOMETERS

BEDROCK TOPOGRAPHY OF SOUTH-CENTRAL IOWA

By
Joseph W. Cagle
1973

For sale by U.S. Geological Survey, price 75 cents