

THE BEDROCK SURFACE AND THE DISTRIBUTION OF THE CONSOLIDATED ROCKS IN MONTGOMERY, GREENE, CLARK, AND MADISON COUNTIES, OHIO¹

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The areal distribution of the different consolidated-rock formations in Ohio depends chiefly on the altitudes and the dips of the beds and on the amount of erosion they have undergone since they were elevated above sea level. In glaciated areas the effects of erosion are generally difficult to determine because of the covering of glacial drift over the bedrock. Only in areas where considerable information is available on the thickness of the glacial drift is it possible to map accurately the areal distribution of the consolidated rocks. Information on the topography of the bedrock surface was not available to earlier geologists, and as a consequence the State geologic maps do not show in detail many areas where certain of the consolidated rocks have been removed by erosion.

The first detailed mapping of the bedrock surface in the glaciated portion of Ohio was by Wilber Stout, former State Geologist, and was published by the Ohio Geological Survey as part of a bulletin on the ground-water resources of the State.³ Stout outlined the principal buried valleys and discussed the preglacial drainage systems and their erosion cycles. More recently, as a result of an intensive investigation of the water resources of the State being conducted by the U. S. Geological Survey and the Ohio Department of Natural Resources, Division of Water, much additional information has become available on the bedrock surface of the west-central part of the State, principally in Montgomery, Greene, Clark, and Madison Counties. From data obtained from well drillers and from field studies, the thickness of the glacial drift has been determined at numerous places and contours having a 50-foot interval have been drawn on the bedrock surface. Information is sufficient to outline the main buried valleys and to determine approximately the altitudes of their floors. Maps have also been drawn showing the areal distribution of the consolidated rocks, based on the altitudes and the dips of the beds, and on the irregularities of the bedrock surface. This information is being published by the Ohio Division of Water in the form of bulletins on the water resources of the respective counties under discussion.⁴ Except in the case of Madison County the geologic data are shown on base maps made up of the standard U. S. Geological Survey topographic quadrangle maps having a scale of approximately 1 inch to the mile; the base for Madison County is approximately 1 inch to two miles.

The floors of the buried valleys in west-central Ohio were eroded to altitudes of approximately 500 feet above sea level before the valleys were filled with glacial

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³Stout, Wilber, Ver Steeg, Karl, and Lamb, G. F., *Geology of Water in Ohio: Geol. Survey of Ohio, 4th ser., Bull. 44, 1943.*

⁴Bulletin 12, *The water resources of Montgomery County, Ohio*, by Norris, S. E.; Cross, W. P., and Goldthwait, R. P., 1948.

Bulletin 19, *The water resources of Greene County, Ohio*, by Norris, S. E.; Cross, W. P., and Goldthwait, R. P., 1950.

Bulletin 22, *The water resources of Clark County, Ohio*, by Norris, S. E.; Cross, W. P., and Goldthwait, R. P., (in preparation).

Bulletin —, *The water resources of Madison County, Ohio*, by Norris, S. E.; Cross, W. P., and Goldthwait, R. P., (in preparation).

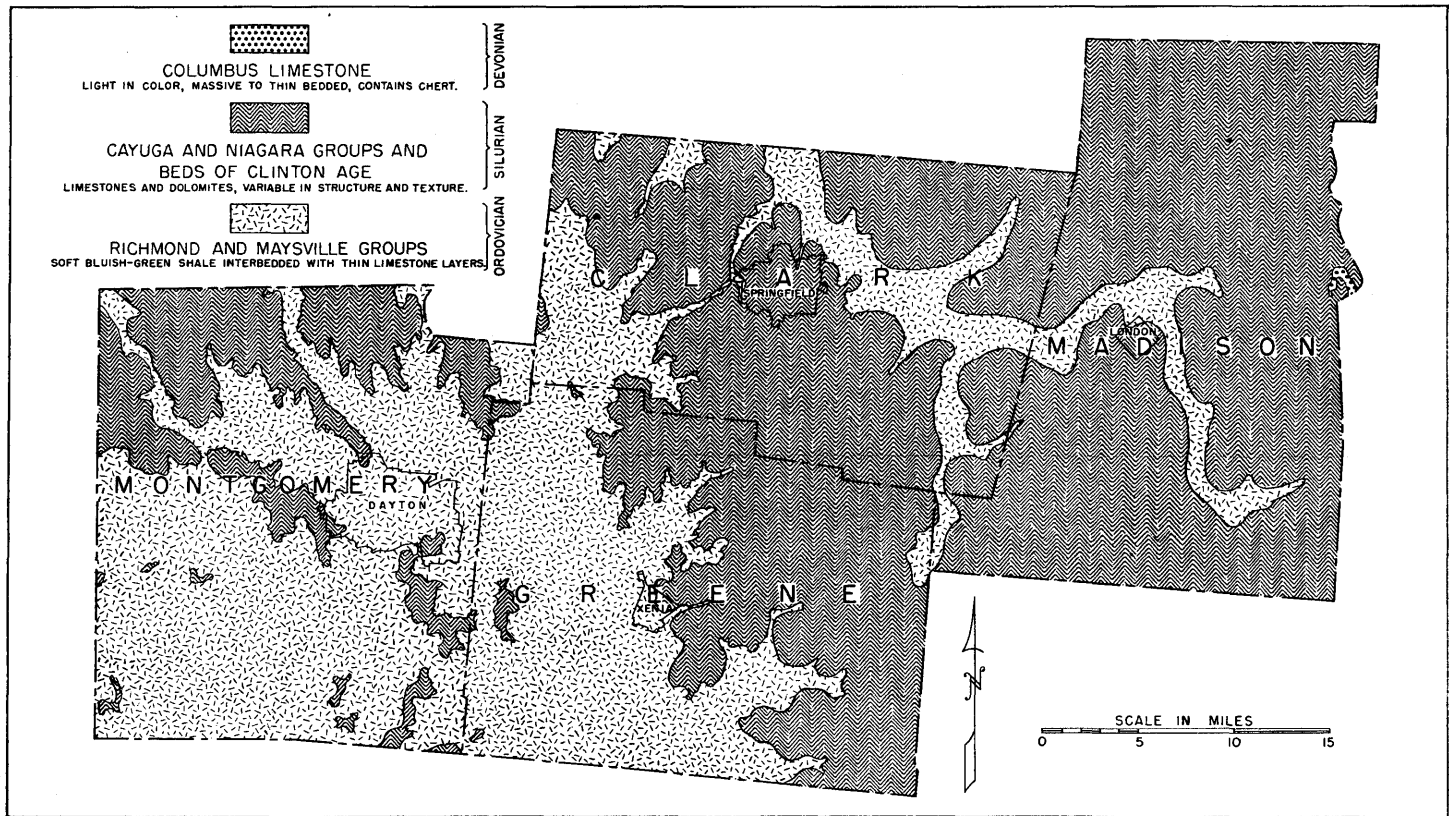


FIG. 1. The distribution of the consolidated rocks in Montgomery, Greene, Clark, and Madison Counties, Ohio.

drift. The present altitude of the land surface in parts of Clark and Madison Counties is more than 1,100 feet above sea level, indicating maximum depths to bedrock of as much as 600 feet where areas of highest altitude coincide with the buried valleys. The greatest known thickness of drift within the area is approximately 3 miles northwest of London in Madison County, where a well at the State prison farm failed to reach bedrock at a depth of 520 feet. Another well, at the Springfield waterworks in Clark County, penetrated bedrock at the depth of 422 feet, or at an altitude of approximately 548 feet above sea level. In areas of former drainage divides, bedrock occurs at altitudes of more than 1,000 feet above sea level. Preglacial relief, therefore, was on the order of 500 feet, which is considerably greater than the present relief of the area. The incising of the consolidated rocks to such great depths by the preglacial streams has had considerable effect on the areal distribution of sub-drift outcrops of the rocks, because many of the younger formations have been removed by erosion along the axes of the buried valleys.

The average dip of the consolidated rocks in the area under discussion is approximately 13 feet per mile to the northeast. The dip was measured on the shale at the top of the Richmond group of Ordovician age, a convenient and well-marked stratigraphic horizon. The Cincinnati anticline is the dominant structural feature of western Ohio. The dip of the beds ranges from nearly horizontal in parts of Montgomery County, which is near the crest of the anticline, to a maximum of about 40 feet per mile in eastern Madison County, which is on the eastern flank of the anticline. The top of the Richmond group crops out in Montgomery County and in western Greene County at altitudes ranging from about 980 to 850 feet above sea level. In eastern Madison County the top of the Richmond group is as low as 300 feet above sea level, or as much as 650 feet below the present land surface.

As shown on the accompanying plate (Fig. 1), Ordovician rocks crop out beneath the glacial drift in most of Montgomery County, in much of Greene County, in the buried valleys in Clark County, and in part of Madison County. Rocks of Silurian age make up the bedrock in most of the remaining area, and Devonian rocks, the youngest strata of the area, are confined to a small erosional remnant in eastern Madison County.

In some parts of the State adequate ground-water supplies cannot be obtained from the glacial drift. In such areas it is important to know the areal distribution of the consolidated rocks. Especially is this true because of the great differences in the water-bearing properties of those rocks. In west-central Ohio adequate water supplies for farm or domestic purposes are generally available from the Silurian and the Devonian rocks, whereas satisfactory supplies can seldom be obtained from the Ordovician rocks. Precise knowledge of the areas underlain by the consolidated rocks, therefore, might, in certain cases, prevent much needless expense by eliminating useless drilling for rock formations that may not occur at the site being prospected.

The present investigation of the ground-water resources of Ohio has recently been extended into Champaign, Franklin, and Pickaway Counties. Detailed information on the bedrock surface and the distribution of the consolidated rocks in those counties should aid greatly in determining whether water-bearing consolidated rocks are present at sites chosen for prospective ground-water developments, and in addition constitute an important contribution to the geologic knowledge of the State.