The front and back sides of Map 64, *Surficial Materials of Pennsylvania,* appear on pages 2 and 3 of this PDF file.

Map 64 is out of print but has useful general information. It is important to note that since its publication in 1989, additional mapping of glacial deposits in northeastern Pennsylvania has occurred. A more up-to-date interpretation of the late Wisconsinan glacial border and of the general distribution of glacial diamicts (tills) can be found on Map 59.

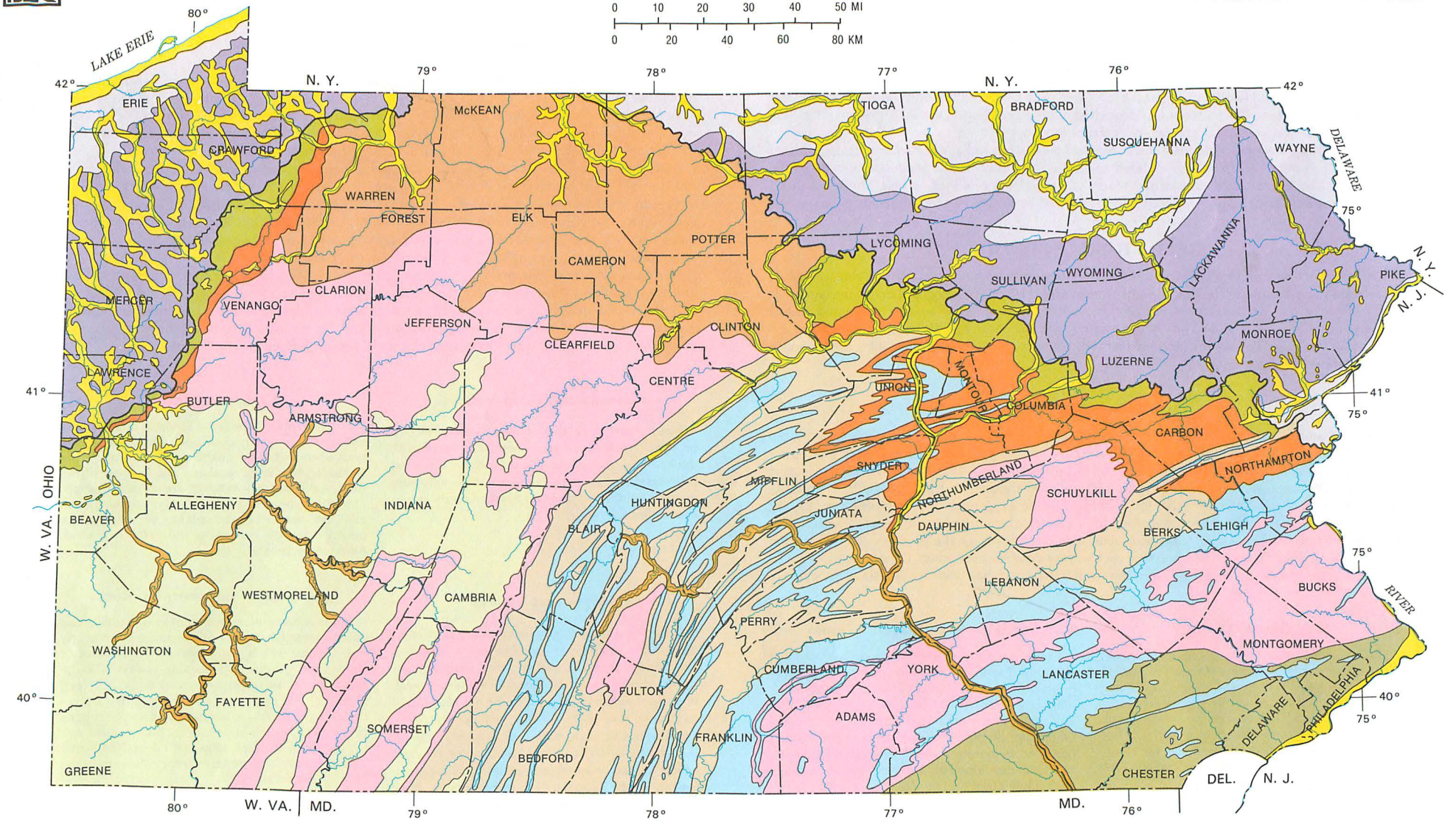
MAP 64

SURFICIAL MATERIALS OF PENNSYLVANIA

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL RESOURCES
OFFICE OF PARKS AND FORESTRY
BUREAU OF
TOPOGRAPHIC AND GEOLOGIC SURVEY

SCALE 1:2,000,000

0 10 20 30 40 50 MI
0 20 40 60 80 KM



EXPLANATION

(See reverse side for detailed explanation of map units)

GLACIAL DIAMICTS

- STRATIFIED SAND AND GRAVEL
- STREAM TERRACE DEPOSITS
- Silty glacial diamict
- Sandy glacial diamict
- Sandy to silty glacial diamict
- Sandy to clayey glacial diamict

RESIDUUM, COLLUVIUM, AND ALLUVIUM

- Plateaus and deep valleys
- Ridges and valleys
- Mixed topography and rocks
- Carbonate rocks
- Igneous and metamorphic rocks
- Residuum and landslides

SYMBOLS

- Approximate contact between surficial materials
- Late Wisconsinan glacial border

Compiled by W. D. Sevon

DER #381-3/92

SURFICIAL MATERIALS OF PENNSYLVANIA

STRATIFIED SAND AND GRAVEL

Stratified sand and gravel includes flat-surfaced deposits in valley bottoms and hummocky deposits along valley sides. The valley-bottom deposits comprise clay, silt, sand, and gravel arranged in distinct layers, which are approximately parallel to the surface. The range of grain size within any layer is generally small (well sorted), and each layer may be laterally continuous for a few feet or several hundred feet. The material was deposited either from flowing water of streams (alluvium, outwash) or in quiet waters of glacial lakes (lake deposits).

The hummocky, valley-side deposits are composed mainly of sand and gravel arranged in distinct layers, which commonly are steeply inclined and have large contrasts in grain size between adjacent layers. The lateral continuity of the layers is generally a few feet or less. These materials occur in kames or kame terraces, which were deposited by flowing water adjacent to glacial ice.

STREAM TERRACE DEPOSITS

Stream terrace deposits are isolated, narrow, thin to moderately thick deposits of clay, silt, sand, gravel, and some boulders. The materials are moderately to poorly sorted and occur in layers that vary from poorly to well defined. Deposited by flowing river water when the streambed was at the level of the deposit, the deposits occur on long, narrow, relatively flat or gently inclined surfaces at various heights above the modern river. The terraces are commonly benchlike, their margins clearly defined by steep slopes.

GLACIAL DIAMICTS

Glacial diamicts, often called glacial till, are unconsolidated, nonsorted or poorly sorted, nonlayered or vaguely layered deposits consisting of clay, silt, sand, gravel, and boulders. The larger clasts, cobbles and boulders, generally appear to be floating in a finer grained matrix. Most of the pebbles, cobbles, and boulders in the diamict are sandstone or siltstone derived from underlying or nearby bedrock. Some far-travelled lithologies, such as igneous or metamorphic rocks, are locally present. Glacial diamicts are formed by a variety of mechanisms associated with movement or melting of glacial ice. Areas of glacial diamicts shown on the map are defined on the basis of texture of the matrix, the amount of rock surface covered by diamict, the degree of weathering and soil development, and the degree to which the diamict has been eroded since deposition.

Silty Glacial Diamict

Silty glacial diamict has moderate to abundant silt and clay matrix. Thickness is variable; diamict greater than 3 feet in thickness covers over 75 percent of the area of occurrence in northwestern Pennsylvania and 25 to 50 percent of the area of occurrence in northeastern Pennsylvania. Deposits less than 3 feet thick are common. The diamict has minimal weathering, has thin soil development, and generally has suffered little erosion.

Sandy Glacial Diamict

Sandy glacial diamict has moderate to abundant silt and sand matrix and minimal clay. The diamict overlies mainly sandstone bedrock. Thickness is variable; diamict greater than 3 feet thick covers over 75 percent of the area of occurrence in northwestern Pennsylvania and 25 to 50 percent of the area of occurrence in northeastern Pennsylvania. Deposits less than 3 feet thick are common. The diamict has minimal weathering, has thin soil development, and generally has suffered little erosion.

Sandy to Silty Glacial Diamict

Sandy to silty glacial diamict has variable amounts of sand and silt in the matrix and generally small amounts of clay. Thickness is variable; diamict greater than 3 feet thick covers only 10 to 25 percent of the area of occurrence, and there is no diamict on the remaining surface. The diamict has been moderately weathered, has moderately thick soil development, and has been moderately to severely eroded.

Sandy to Clayey Glacial Diamict

Sandy to clayey glacial diamict has variable amounts of sand, silt, and clay in the matrix. Thickness is variable; diamict greater than 3 feet thick covers less than 10 percent of the area of occurrence, and there is no diamict on the remaining surface. The diamict has been deeply weathered, has thick soil development, and has been largely removed by erosion.

RESIDUUM, COLLUVIUM, AND ALLUVIUM

Differences in the general character of residuum, colluvium, and alluvium deposits are used to define several areas shown on the map.

Residuum is a surface accumulation of unconsolidated rock debris developed in place by the processes of physical and chemical weathering operating on the underlying bedrock. Residuum varies in character from thin accumulations of angular rock fragments broken from the bedrock by the physical process of freeze and thaw to thick accumulations of unfragmented bedrock that has been extensively altered by chemical weathering (**saprolite**).

Colluvium is a hillside deposit of unconsolidated, generally matrix-supported, poorly sorted material that has been transported downslope by gravity-driven processes ranging in rate from slow (creep) to fast (debris flow). **Talus** is a form of colluvium that lacks matrix and generally offers poor support for vegetation. Rock fragments in colluvium are generally angular to subangular and range widely in size. The material originated from weathering of bedrock. Most colluvium in Pennsylvania was formed during multiple intervals of the Pleistocene.

Alluvium comprises unconsolidated, well- to poorly defined layers of clay, silt, sand, gravel, and some boulders. The constituent particles vary from well to poorly sorted and are subangular to well rounded. Individual layers generally are not continuous for more than a few feet. The alluvium is a flat-surfaced deposit on valley bottoms into which the modern stream is trenching. Alluvium is deposited by flowing water in stream channels and on adjacent floodplains.

Plateaus and Deep Valleys

Flat-surfaced to gently sloping uplands developed on mixed rock types are generally covered with thick (>5 feet) residuum. The uplands are dissected by steep-sloped valleys, which have some colluvium on the hillsides and thin (<3 feet) alluvium in narrow valley bottoms.

Ridges and Valleys

Long, steep-sloped, curvilinear ridges developed on resistant sandstones have broken rock at their crests and/or thick talus or colluvium covering most of the adjacent hillsides. The colluvium is generally thickest on the lower parts of the hillsides. Broad to narrow, low-relief, interridge valleys are developed on less resistant rock types and have thin to moderately thick (3 to 5 feet) residuum on the crest of low hills and some thin to moderately thick colluvium on the hillsides. Thin to moderately thick alluvium occurs in narrow drainageways.

Mixed Topography and Rocks

Mixed topography developed on mixed rock types has moderately thick residuum on upland surfaces and thin to moderately thick colluvium on hillsides. Thin to moderately thick alluvium occurs in the valley bottoms.

Carbonate Rocks

Carbonate rocks underlie lowland areas having low relief and poorly developed surface drainage. Both open and filled sinkholes are common. Thin to moderately thick residuum covers most of the surface, but bedrock outcrops are locally common. Thin to moderately thick colluvium derived from adjacent, noncarbonate uplands occurs in some places along the margins of the carbonate areas. Alluvium is generally thin.

Igneous and Metamorphic Rocks

Igneous and metamorphic rocks underlie broad upland areas having smoothly rounded and nearly flat hilltops, which grade laterally into smoothly shaped and gradually deepening valleys. The upland surfaces are underlain by very thick (>10 feet) saprolite. The upper parts of the hillsides are underlain by thin to thick saprolite, and the lower parts of the hillsides are underlain by thin to thick colluvium. Thin to thick alluvium covers the broad valley bottoms and grades into the colluvium at the base of the hillsides.

Residuum and Landslides

Mixed topography developed on mixed rock types has moderately thick to thick residuum on the upland surfaces and moderately thick to thick colluvium on the hillsides. Up to 30 percent of the surface is underlain by landslide debris, particularly in the southwestern five counties. The landslide debris in many places comprises chaotic mixtures of residuum, colluvium, and bedrock, which have moved down the hillside by gravity-driven sliding. Alluvium is thin to thick.