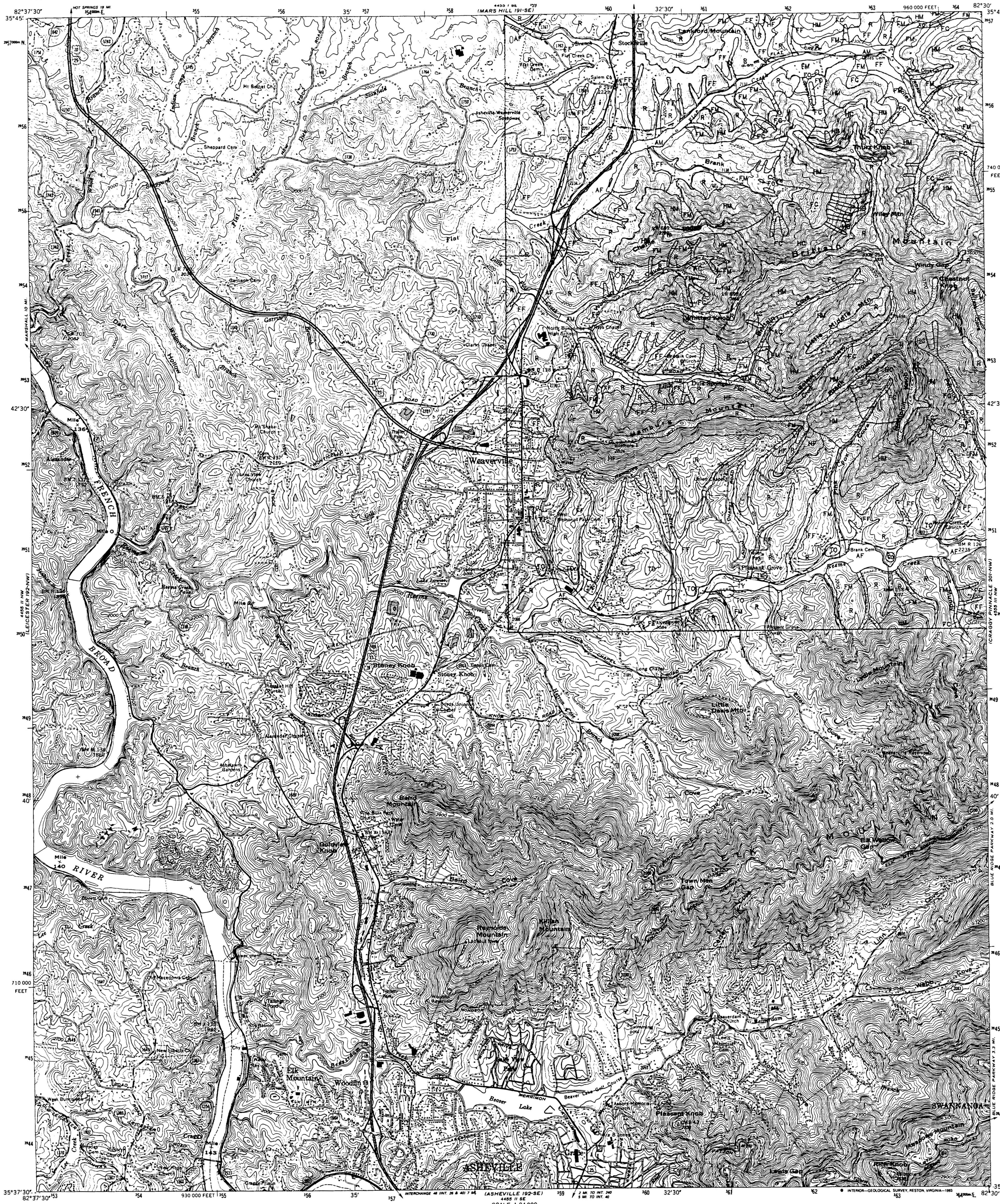
NORTH CAROLINA DEPARTMENT OF ENVIRONMENT, HEALTH AND NATURAL RESOURCES

NORTH CAROLINA GEOLOGICAL SURVEY
DIVISION OF LAND RESOURCES

OPEN-FILE REPORT 96-4

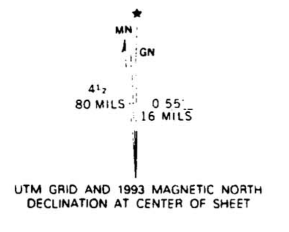


Digital representation by Michael A. Medina

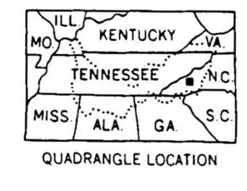
SCALE 1:24 000

CONTOUR INTERVAL 20 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

Geology mapped 1989 - 1990



MAP OF SURFICIAL DEPOSITS, NORTHEAST QUARTER OF THE WEAVERVILLE 7.5 - MINUTE QUADRANGLE



By

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1996

INTRODUCTION

Relatively little surficial mapping has been carried out in the unglaciated Appalachians. Generally it has assumed that adequate knowledge of surficial materials can be obtained from U. S. Department of Agriculture Natural Resources Conservation Service (NRCS) soils maps. However, mapping of the unconsolidated mantle from a geomorphic perspective can add significant knowledge to that available from the pedologic approach. The geomorphic approach is particularly appropriate for understanding the genesis of transported parent materials that underlie wide areas in the more mountainous parts of the Appalachians.

THE STUDY AREA

The northeast quarter of the Weaverville Quadrangle provides a good example of low-mountain topography that is transitional between the saprolite dominated landscape of the Asheville Basin and the colluvium-dominated landscapes of the higher mountains of the Blue Ridge. Elevation in the study area ranges from 2020 to 3900 ft. The bedrock consists predominantly of late Proterozoic metamorphic rocks of the Ashe Metamorphic Suite. Locally, metagraywacke and muscovite-biotite schist dominate. Middle Proterozoic rocks, largely biotite and hornblende-bearing layered gneisses, occupy about one fourth of the study area to the northwest. Late Paleozoic trondjemite dikes are significant because the massive, homogeneous rock is highly resistant to weathering and provides many boulders.

REGOLITH AND THE GEOMORPHIC SYSTEM

Regolith is the most inclusive term for unconsolidated surficial rock material. Rock debris weathered from mountain slopes moves downslope under the influence of gravity and running water, ultimately coming to rest on the gentle footslopes at the base of the mountains or on the floodplains of streams draining the mountains. Mountain slopes, footslopes, and stream floodplains are thus mantled with transported regolith. In contrast, flat areas and low hills beyond the footslope receive little or no transported rock debris from higher areas, and instead are mantled with residual regolith produced by weathering of the underlying bedrock, commonly called residuum or saprolite. The basic four categories of regolith used here for mapping are hillslope deposits, footslope deposits, alluvium, and residuum. Each of these is discussed in more detail below.

MAPPING AND MAPPING UNITS

It was feasible to traverse only a small part of each mountain flank, therefore interpolation and extrapolation was used extensively in mapping mountain slopes. The assumption was made that regolith characteristics observed on a slope could be extrapolated laterally as long as slope angle and aspect remained similar. Hillslopes are not planar but are corrugated by alternating hollows (shallow streamless valleys) and noses (low divides between the hollows). HD in hollows typically is coarser than that on noses.However, no attempt has been made to map this detailed variation and each hillslope was classified according to the regolith found in its hollows.

The surficial units were subdivided principally according to the range and maximum sizes of coarse rock fragments. The mapping units and symbols are as follows;

Residuum

Residuum, often called saprolite when developed on crystalline rocks such as are present in the local area, occurs at the surface extensively in footslope areas and on the gently rolling topography of the Asheville basin, near and beyond the west margin of map area. Well logs in and near the study area show that saprolite commonly exceeds 30 m in thickness, although the mean is probably closer to 15 or 20 m. The soil on the saprolite is very red (e.g., Munsell hue of 2.5YR) and clay rich. The associated soil series is Hayesville. Saprolite also crops out on some gently sloping mountain flanks and, perhaps more surprisingly, on the crests of most mountain ridges. Soils in these locations are the Evard-Cowee and Edneyville-Chestnut complexes.

Residuum, or saprolite, shows few surface clasts except for occasional quartz pebbles or cobbles derived from quartz veins.

R = Residuum (saprolite)

Hillslope deposit

Most hillslopes exceeding 10 degrees are covered with a layer of surficial debris in transit down the slope, derived from upslope regolith and rock outcrops. Thickness ranges from about 0.5 m to 3 m or so. This debris is herein referred to as hillslope deposit (HD). Processes involved in the downhill movement of HD include creep, tree uprooting, slope wash, and sliding.

On NRCS soils maps (still incomplete for this area at time of writing), a large part of the area mapped here as HD is shown as residual soils, with a smaller part shown as rock outcrops. This apparent contradiction simply reflects the different focus of the two approaches. The soil profiles on these slopes are indeed developed largely on residual materials. However, the main process affecting the surface is erosion. Thin, discontinuous layers of transported regolith (colluvium) commonly occur at the top of these profiles, some of the material apparently having traveled long distances downslope.

Although the relationship between the surficial geology map and the soils maps is very general, coarser HD tends to correspond to the Cleveland Chestnut-Rock outcrop complex, less-coarse HD to the Edneyville-Chestnut complex, and the finest HD to the Evard-Cowee complex.

HD was subdivided on the basis of its appearance in hollows on mountain flanks.

HF - Fine-grained HD. Virtually no rocks are seen protruding above turf or forest duff. Exposures show that clasts larger than 0.1 m in intermediate diameter are rare, although occasional large clasts may occur. Bedrock outcrops are rare, except on some hollow floors.

HM - Medium-grained HD. This is the most common HD in the study area. Boulders 0.25 m or larger in diameter are common in hollows, with boulders as large as 1.0 m rare. Bedrock outcrops are common along side slopes of hollows. Boulders and bedrock outcrops are somewhat less common on noses.

HC - Coarse-grained HD. Large boulders (ranging from 0.25 m to several meters in intermediate diameter) are common in hollows. Bedrock ledges up to several meters high crop out on hollow side slopes and noses. On noses, boulders are common immediately downslope from ledges on noses but may be less common elsewhere.

HB - Boulder HD - boulder streams and boulder fields. This unit occurs for the most part only in hollows. It often occurs below mountain slopes that have extensive outcrops of resistant bedrock and exceptionally steep slope angles. The floor of the hollow is completely covered with large (0.25 m to several meters in diameter) boulders with an absence of a finer matrix in the upper layers. Boulder streams range from 10 to 40 m in width, and some may be relicts of late-Pleistocene periglacial climates.

Footslope deposit

Footslope deposit (FD) is a broad category that includes diverse deposits along the gentle footslopes of mountain flanks. These deposits differ from the HD on hillslopes, however, in that they are transported by a flow of some type, be it debris flow, hyperconcentrated flow, or torrential water flow. Rather than being in continual movement as is hillslope HD, FD remains stationary for long periods until being re-eroded and transported. FD occurs primarily along hollows and first-order streams of the footslopes, but also as aprons along the base of mountains and as "cove" deposits in broad-floored embayments in mountain flanks. The intervening noses are for the most part mantled with saprolite, with the exception of some high-level relict alluvial deposits. Deposits generally are somewhat thicker than HD, reaching thicknesses up to 15 m, although the average is probably less than 5 m.

The first- and second-order streams on the footslopes differ from the larger streams discussed below in that floodplains are poorly defined and deposits along the streams include large amounts of unsorted, poorly stratified coarse debris that appears to have originated by debris flow or hyperconcentrated flow. Obviously water-laid deposits, characterized by at least crudely developed layering or sorting, are sparse or missing. These deposits are thus classified as FD rather than alluvium.

Soils mapped in footslope areas include Tate gravelly loam and the Tuckasegee-Cullasaia complex. The latter is associated with coarser materials and steeper slopes than is the Tate.

FD was subdivided by clast size for mapping. One additional unit was added for relict footslope deposits.

FF - Fine-grained FD. Clast sizes for the most part are no larger than pebbles; few clasts larger than 0.1 m are seen. The unit is most common in small stream valleys and hollows that head in areas covered largely by saprolite or by fine-grained HD. In some places, several meters of fine sediment have accumulated in footslope streams following clearing of forests by European settlers in the 19th and early 20th centuries, although generally FF deposits are only a meter or so thick. Stream floors may expose bedrock.

FM - Medium-grained FD. Streams contain many clasts of cobble and small-boulder size (0.1 m), and scattered larger clasts occur, although most clasts are less than 0.25 m in diameter. Surface layers away from streams, however, often consist mainly of loam to clay loam with few clasts, although scattered large clasts may occur on the surface.

FC 3 - Coarse-grained FD. Boulders from 0.25 m to several meters in diameter are common in streams, although surface layers may consist of sandy loam or loamy sand. Fan-type deposits often show matrix-supported deposits with numerous subangular cobbles and small boulders, and occasional large boulders. These are probably debris-flow deposits.

Broad-floored coves, such as Lowery Cove and Brank Cove in the study area, usually contain much of this coarse debris in their upper ends. Generally this debris is somewhat thicker than deposits of finer-grained footslope deposits. Streams usually flow between at the contact between this bouldery fill and the cove walls, rather than across the fill.

F0 - Older, high-level deposits on footslopes. These are analogous to stream terraces and are recognized by their positions above the modern drainageways and by their red soils with decomposed clasts.

Alluvium

Alluvium as used herein refers not simply to deposits by flowing water, but to deposits associated with 3rd-order or larger streams, which are characterized by well defined floodplains, bedding, and upward-fining vertical sequences. Well logs locally show that deposits in these streams rarely exceed 6-8 m in thickness, and bedrock is commonly exposed in the stream channel. The main soil on these deposits is the French series. Some of the coarser alluvium is mapped as Dellwood series. Relict, high-level alluvium that has developed a red soil profile may be mapped as Braddock series.

The classification used here for recent alluvium is based on particle size of channel deposits. Two additional mapping units are used for relict, high-level alluvium; the difference between them is based on relative age.

AF - Fine-grained alluvium. Channel deposits are composed mainly of pebbles and cobbles. Clasts larger than 0.1 m are rare. Overbank deposits consist of loam to sandy loam.

AM - Medium-grained alluvium. Channel deposits contain substantial numbers of clasts larger than 0.1 m in diameter, but few larger than 0.25 m. Overbank deposits commonly range from loam to loamy sand.

AC - Coarse-grained alluvium. Boulders larger than 0.25 m in diameter are common in channel deposits; some exceed 0.5 m. Overbank deposits commonly range from loamy sand to sand.

TY - Younger alluvial terrace deposits. Deposits are on terraces 5-10 m above the elevation of the modern stream. TY was extensive enough to map only along the valley of Reems Creek.

TO - Older alluvial terrace deposits. Deposits are on terraces 10-50 m above the elevation of the modern stream. Except for the lowest terraces, the original flat terrace surfaces have been destroyed by erosion and replaced by a rolling topography. T0 was extensive enough to map only along the valley of Reems Creek.

SOIL TERMINOLOGY

The soil nomenclature used herein is taken from the Buncombe Co. Soil Service, in progress, U. S. Department of Agriculture Natural Resources Conservation Service (NRCS) soils maps.

ACKNOWLEDGEMENT

Field mapping was performed as part of a cooperative effort (COGEOMAP, contract agreement 14-08-0001-A0657) between the North Carolina Geological Survey and the U.S. Geological Survey.