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Basemap compiled from USGS-TVA 1:100,000-scale topographic maps dated from 1940-1980. Planimetry revised from aerial photographs taken 1975-1981 and other source data. Map edited 1983. Projection and 10,000-meter grid, Zone 17, Universal Transverse Mercator. 25,000-foot grid ticks based on Tennessee and North Carolina coordinate systems 927 North American Datum

30m resolution hillshade created by National Park Service, GRSMNP Field Office Derived from USGS 30m Digital Elevation Models. Universal Transverse Mercator, Zone 17, 1927 North American Datum

SCALE 1:100 000

1 0 1 2 3 4 5 6 7 8 MILES

1 0 1 2 3 4 5 6 7 8 9 10 KILOMETERS

SURFICIAL GEOLOGIC MAP OF THE GREAT SMOKY MOUNTAINS NATIONAL PARK REGION, TENNESSEE and NORTH CAROLINA

By

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2003

UTM GRID AND 1994 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

MAP LOCATION

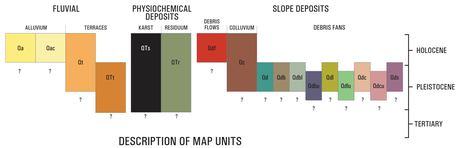
Geology mapped by Scott Southworth and Art Schultz, 1993-2003

Digital Compilation and Cartography completed by Danielle Denenny and James Triplett, 2002-2003

EXPLANATION

- Boundary of the Great Smoky Mountains National Park
- Bedrock and residuum

CORRELATION OF MAP UNITS



DESCRIPTION OF MAP UNITS

FLUVIAL DEPOSITS AND LANDFORMS

ALLUVIUM

Qa **Alluvium (Holocene)** - Unconsolidated silt, sand, cobbles, and small boulders along and beneath streams, floodplains and alluvial plains. Sediments well to poorly stratified, commonly in fining-upward sequences as much as 20 ft (6 m) thick. Includes alluvial terraces, colluvium, and debris from adjacent slopes as much as 40 ft (12 m) above stream channel. Bedrock outcrops too small to portray are exposed locally

Qac **Coarse alluvium (Holocene)** - Cobbles and large boulders mostly of massive metamorphosed sandstone and conglomerate along upper reaches of streams and flood plains in the Blue Ridge highlands. Coarse alluvium may be transitional with boulder debris on slopes. Rounded and sub-rounded boulders were derived and reworked from debris and colluvial deposits

TERRACES

Qt **Terrace deposits (Holocene and Pleistocene)** - Unconsolidated sand, gravel, cobbles, and boulders are comprised mostly of quartz-rich rocks; metasiltstone cobbles may also be present. Deposits have been left by rivers along most major drainages. Deposits range from 0 to 30 ft (0 to 9 m) thick and are on terraces cut into bedrock. Terraces are as much as 30 ft (9 m) above present flood plain alluvium and some grade down-slope into alluvium. Deposits have been eroded from some terraces. Terraces shown in Cades Cove, Tuckaleechee Cove, and south of Cosby are transitional with up slope debris deposits

QTt **Upper level terrace and deposits (Pleistocene)** - Unconsolidated sand, gravel, cobbles and boulders of quartz-rich rocks mostly deposited by rivers. Deposits largely have been eroded from terraces that are as much as 200 ft (60 m) above present flood plain alluvium. Elevated landform and deposit are from an old erosion surface. In Tuckaleechee Cove, upper level terrace may be transitional with metasandstone debris

LANDFORMS AND DEPOSITS OF PHYSIOCHEMICAL WEATHERING

QTs **Sinkholes (Holocene)** - Solution depressions (sinkholes) and hummocky karst consisting of clusters of sinkholes and bedrock pinnacles, and cave openings in areas underlain by carbonate bedrock. Sinkholes are common in the Tennessee Valley but are also found within the tectonic windows in the foothills of the western Blue Ridge of Tennessee. Sinkholes are developed in alluvial valleys, on mountain tops, and within debris fan deposits and fluvial terraces

QTr **Residuum (Holocene)** - Pebbles, cobbles, and small boulders of sub-angular chert, quartz, and jasperoid in red clay and silty soil overlying carbonate bedrock units in the western foothills. Includes a mixture of gravel of quartzite and vein quartz, pellets of manganese and iron, sand, and deep-red silt in broad areas of the Tennessee Valley that may be old alluvium mixed with residuum (Neuman and Wilson, 1960)

SLOPE DEPOSITS

DEBRIS FLOWS

Qdf **Debris-flow scars and deposits (Holocene)** - Debris flow scars, tracks, and deposits in the Blue Ridge highlands as the result of modern and historic storms with high rainfall. Scars at the head areas are underlain by mostly slate bedrock, but bedrock, minor rubble, and vegetation are in scars in hollows and chutes oriented down slope. Deposits consist of slabby boulders, cobbles, and finer rock fragments of fresh slate and metasandstone, minor soil, and vegetation including trees and shrubs. On lower slopes, scars in channels have deposits consisting of logs and rock rubble that form terraces as much as 30 ft (9 m) thick. Debris flow scars, tracks, and deposits of post-1900 to pre-1970, and post-1970 debris flows are usually free of vegetation (Schultz, 1999)

COLLUVIUM

Qc **Colluvium (Holocene and Pleistocene)** - Boulder streams, boulder fields, and talus containing minor alluvium and debris. Boulder streams and boulder fields are chiefly Pleistocene in age, whereas colluvium ranges from Pleistocene to Holocene. Deposits are clast-supported diamicton of angular to sub-rounded boulders and cobbles of quartz-rich rock. Sandstone and quartzite on Chilhowee Mountain, Tennessee, and metasandstone, metaconglomerate, quartzite, and gneiss in the Blue Ridge highlands form distinct colluvium types but are not differentiated on the map. The sandstone and quartzite on Chilhowee Mountain forms equidimension, 0.5m angular blocks of colluvium. Gneiss and quartzite form meter-long slabby blocks of colluvium. Metasandstone and metaconglomerate colluvium blocks range more widely in size. Colluvium deposit surfaces are blocky and sparsely vegetated, and occur on higher slopes as talus near bedrock outcrop and escarpments, and as fill in steep hollows. Colluvium grades down slope and is transitional into debris fans. Thickness ranges from 10 to 100 ft (3 to 30 m)

DEBRIS FANS

Qd **Metasandstone debris fans (Pleistocene)** - Matrix-supported diamicton that forms fans on lower slopes and valleys of the foothills of the western Blue Ridge in Tennessee. Consists of poorly-sorted sub-rounded boulders, cobbles, and pebbles of quartz-rich rock in a matrix of pebbles, sand, silt and clay that may be locally stratified. Fan-shaped deposits consist of metamorphosed sandstone and conglomerate of Cades Sandstone and the Walden Creek Group from the foothills of the western Blue Ridge, Tennessee. Vegetation and boulders occur on the surface

Qdb **Boulder debris fans (Pleistocene)** - Matrix-supported diamicton that forms fans on lower slopes and valleys in the Blue Ridge highlands. Consists of sub-rounded boulders, cobbles, and pebbles of massive metamorphosed conglomerate and sandstone of the Great Smoky Group. Matrix ranges from stratified to unstratified pebbles, sand, silt and clay. Fan are vegetated and boulders occur on the surface. Thickness 10 to 100 ft (3 to 30 m)

Qdbl **Boulder debris fans above carbonate bedrock (Pleistocene)** - Matrix-supported diamicton that forms bouldery fans on lower slopes of coves underlain by carbonate bedrock. Consists of sub-rounded boulders, cobbles, and pebbles of massive metamorphosed conglomerate and sandstone of the Great Smoky Group. Matrix consists of pebbles, sand, silt and clay. Thickness unknown; base may be modified by karst. Fan deposits are vegetated by grass fields and forests, and boulders are scattered on the surface

Qdfu **Upper-level fan of boulder debris (Pleistocene)** - Matrix-supported diamicton fan of sub-rounded boulders, cobbles, and pebbles of metamorphosed conglomerate and sandstone of the Great Smoky Group that underlies a terrace. Fan is as much as 120 ft (36 m) above adjacent boulder debris fans and alluvium near Cosby, TN, and is the remnant of an older debris fan

Qdl **Metasandstone debris fan above carbonate bedrock (Pleistocene)** - Matrix-supported diamicton that forms cobbly fans on slopes and valleys of coves underlain by carbonate rock in the foothills of the western Blue Ridge. Consists of sub-rounded boulders, cobbles, and pebbles of metasandstone and metasiltstone in a matrix of pebbles, sand, silt and clay that is locally stratified. Fan-shaped deposits are transitional down-slope to fluvial terraces and alluvial plains. Thickness unknown; base may be modified by karst. Fan deposits are vegetated by grass fields and forests, and boulders are sparsely scattered on the surface

Qdlu **Upper-level metasandstone debris fan above carbonate bedrock (Pleistocene)** - Three fans of cobbly meta-sandstone debris in Tuckaleechee Cove, TN, are elevated as much as 80 ft (24 m) above adjacent fans of metasandstone debris, and represent a former erosional surface

Qdc **Sandstone debris fan (Pleistocene)** - Matrix-supported diamicton that form fans on Chilhowee Mountain, TN. Unconsolidated stony material consists of sub-rounded boulders, cobbles, and pebbles of sandstone and quartzite of the Chilhowee Group supported in a red matrix of predominantly sand, with pebbles, silt and clay. Boulders and cobbles in the oxidized red and yellow matrix exposed in excavations have thick weathering rinds, are friable and are weathered to saprolite. Fan deposits are vegetated; sub-rounded boulders and cobbles are present. Thickness ranges from a thin veneer to as much as 40 ft (12 m). Fans are incised as much as 50 ft (15 m) by modern streams, and grade downslope to modern alluvium

Qdcu **Upper-level fan of sandstone debris (Pleistocene)** - Matrix-supported diamicton that form fans on Chilhowee Mountain, TN. Unconsolidated stony material consists of sub-rounded boulders, cobbles, and pebbles of sandstone and quartzite of the Chilhowee Group supported in a rubified matrix of of predominantly sand, with lesser pebbles, silt and clay. Boulders and cobbles in the oxidized red and yellow matrix exposed in excavations have thick weathering rinds, are friable, and are weathered to saprolite. Deposit surfaces are vegetated; sub-rounded boulders and cobbles are present. Thickness ranges from a thin veneer to as much as 40 ft (12 m). Fans are incised as much as 80 ft (24 m) by lower fans of sandstone debris and are as much as 100 ft (30 m) above modern streams

Qcr **Gneiss debris fan (Pleistocene)** - Matrix-supported diamicton forms fans in areas underlain by Mesoproterozoic gneiss. Slab-like boulders of gneiss lie within a matrix that is predominantly sand, silt, and clay. Slabs run parallel to their gneissic foliation and the long axis is generally oriented parallel to slope

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