

# EXPLANATION OF MAP UNITS

## SURFICIAL DEPOSITS

- Qa Alluvium (Holocene)** – Unconsolidated silt, sand, cobbles, and boulders along streams, floodplains, and alluvial plains as much as 40 ft (12 m) above stream channel. Coarse alluvium in the highlands is transitional with boulder debris on slopes
- Qdf Debris flows (Holocene)** – Debris flow scars, tracks, and deposits in the Blue Ridge highlands resulting from modern and historic storms that had high rainfall. Debris flow scars, tracks, and deposits of post-1900 to pre-1970, and post-1970 debris flows are usually not vegetated
- Qc Colluvium (Holocene and Pleistocene)** – Boulder streams, boulder fields, and talus. Deposits are clast-supported diamicton of angular to sub-rounded boulders and cobbles. Colluvium grades down slope and is transitional into debris fans. Thickness from 10 to 100 ft (3 to 30 m)
- Qd Debris fans (Pleistocene)** – Matrix-supported diamicton that form fans and sheets on lower slopes and valleys in the Blue Ridge. Sub-rounded boulders, cobbles, and pebbles, of local rocks are in a matrix of unstratified pebbles, sand, silt and clay. Includes terraces as much as 120 ft (36 m) above adjacent boulder debris fans and alluvium near Cosby, TN. Thickness 10 to 100 ft (3 to 30 m)
- QTt Terrace deposits (Holocene to Tertiary)** – Unconsolidated sand, gravel, cobbles, and boulders deposited along major rivers. Deposits range from 0 to 30 ft (0 to 9 m) thick on terraces as much as 30 ft (9 m) above present flood plains. Includes elevated terraces as much as 200 ft (60 m) above present flood plains
- QTs Sinkholes (Holocene to Tertiary)** – Sinkholes, solution depressions, hummocks, and clusters of sinkholes, bedrock pinnacles, and cave openings in areas underlain by carbonate bedrock
- QTr Residuum (Holocene to Tertiary)** – Pebbles, cobbles, and small boulders of sub-angular chert, quartz, and jasperoid in red clay and silty soil overlying carbonate

## PALEOZOIC ROCKS

### TENNESSEE VALLEY AND TECTONIC WINDOWS

- Mgg Greasy Cove and Grainger Formations, undifferentiated (Lower and Upper Mississippian)**—
- Mgc Greasy Cove Formation (lower Upper Mississippian)**—Interbedded gray calcareous shale, argillaceous limestone, fine-grained sandstone, and red shale and sandstone
- Mg Grainger Formation (Lower Mississippian)**—Noncalcareous siltstone and fine-grained sandstone grades upward into coarser-grained feldspathic sandstone and pebble conglomerate interbedded with silty shale
- MDC Chattanooga Shale (Upper Devonian and Lower Mississippian)**— Dark carbonaceous noncalcareous shale; locally has a few inches of sandstone and sandy shale at the base
- Ob Bays Formation (Middle Ordovician)**— Red calcareous mudrock and siltstone, locally contains coarse-grained feldspathic and quartzitic sandstone interbedded with red fine-grained sandstone

- Os**    **Sevier Formation (Middle Ordovician)**— Gray calcareous silty and sandy shale and locally sandstone
- Oc**    **Chota Formation (Middle Ordovician)**— Blueish-gray calcareous sandstone and sandy limestone
- Oo**    **Ottosee Shale (Middle Ordovician)**— Lower part is calcarenite and sandy limestone and upper part is gray calcareous shale
- Ot**    **Tellico Formation (Middle Ordovician)**— Gray sandy or silty calcareous shale containing beds of calcareous sandstone, fine-grained sandstone, and impure limestone
- Ocr**    **Chapman Ridge Sandstone (Middle Ordovician)**— Gray calcareous sandstone and argillaceous shale
- Ocm**    **Chapman Ridge marble (Middle Ordovician)**— Thick-bedded to massive gray to red, coarsely crystalline marble occurring as lens in sandstone
- Obl**    **Blockhouse Shale (Middle Ordovician)**— Dark-gray fissile calcareous shale containing local beds of sandstone in the lower part and locally at the base thin limestone
- Olh**    **Lenoir Limestone (Middle Ordovician)**— Cobbly argillaceous limestone, locally contains the fine-grained Mosheim Limestone Member and basal clastic rocks of the Douglas Lake Member and Holston Formation
- Oj**    **Jonesboro Limestone (Lower Ordovician)**— Light-gray limestone, laminated to thick-bedded; contains some interbeds of dolomite and sandy limestone (locally includes Middle Ordovician Lenoir Limestone)
- Ock**    **Knox Group (Upper Cambrian and Lower Ordovician)**— Newala Limestone is interbedded dolomite and sandstone, Longview Dolomite contains chert, Chepultepec Dolomite consists of limestone and subordinate dolomite, has sandstone in the upper part, Copper Ridge Dolomite is cherty dolomite; Middle and Upper Cambrian Maynardville Limestone was locally included at base

## Conasauga Group

- Cno**    **Nolichucky Shale (Middle and Upper Cambrian)**— Greenish-gray, calcareous shale interbedded with oolitic limestone
- Cml**    **Maryville Limestone (Middle and Upper Cambrian)**— Limestone containing greenish-gray shale near the base and top
- Crg**    **Rogersville Shale (Middle and Upper Cambrian)**— Variegated purple and green fissile shale has a 20 ft thick limestone bed in middle part
- Crt**    **Rutledge Limestone (Middle and Upper Cambrian)**— Limestone containing argillaceous partings at the base and fine-grained dolomite at the top
- Cpr**    **Pumpkin Valley Shale and Rome Formation (Middle and Upper Cambrian)**— Maroon sandstone, siltstone, and shale, and subordinate quartzite, siltstone, shale, and limestone of the Rome Formation grade upward into greenish-gray and red siltstone, silty shale, and thin layers of limestone of the Pumpkin Valley Shale

## WESTERN BLUE RIDGE

### FOOTHILLS

- Cr** **Rome Formation (Middle Cambrian)**— Maroon shale, siltstone, and sandstone
- Cs** **Shady Dolomite (Lower Cambrian)**— Thick-bedded dolomite containing shaly dolomite (Css)

### Chilhowee Group

- Ccu** **Upper part of Chilhowee Group, undifferentiated (Lower Cambrian)**— Quartzite, argillaceous, silty, micaceous shale, and coarse-grained sandstone, undifferentiated
- Chm** **Helenmode Formation (Lower Cambrian)**— Gray, micaceous shale containing beds of coarse sandstone
- Ch** **Hesse Quartzite (Lower Cambrian)**— Thick-bedded, white quartzite
- Cm** **Murray Shale (Lower Cambrian)**— Greenish-gray, argillaceous to silty shale
- Cnb** **Nebo Quartzite (Lower Cambrian)**— Thin-bedded, white quartzite containing skolithus tubes
- Cn** **Nichols Shale (Lower Cambrian)**— Greenish-gray argillaceous to silty shale with some beds of sandstone and quartzite
- Cc** **Cochran Formation (Lower Cambrian)**— Basal conglomerate overlain by maroon pebbly arkose interbedded containing maroon shale and siltstone, grades upward into light gray arkose, sandstone, and quartzite

## NEOPROTEROZOIC ROCKS

### Walden Creek Group

- Zss** **Sandsuck Formation (Neoproterozoic)**— Greenish-gray siltstone, silty shale, and sandstone. Has thick lenticular beds of coarse-grained sandstone and quartz-pebble conglomerate (Zssc) that occurs in the middle part of section
- Zw** **Wilhite Formation (Neoproterozoic)**— Shale, siltstone, and slate. Has white, vitreous quartzite, sandstone, and polymictic pebble conglomerate (Zwq), limestone and shale (Zwl), and thin beds of carbonate rocks, limestone, and sandy limestone within argillaceous shale (Zwlc)
- Zs** **Shields Formation (Neoproterozoic)**— Dark gray to greenish-gray laminated siltstone and slate, contains beds of limestone and siltstone (Zsl), coarse sandstone and siltstone (Zsa), and coarse conglomerate of polymictic pebbles and cobbles, and pebbly sandstone (Zsc)
- Zll** **Licklog Formation (Neoproterozoic)**— Argillaceous siltstone and slate, and beds of conglomeratic sandstone (Zlls)

## HIGHLANDS

### PALEOZOIC INTRUSIVE ROCKS

- Pzp** **Pegmatite (Paleozoic)**— Tabular, lenticular, irregular bodies of pegmatite (plagioclase, perthite, quartz, muscovite, or biotite). Ranges from 1 inch thick and 12 inch long to 210 feet thick and 490 feet long

### PALEOZOIC AND NEOPROTEROZOIC DIKES AND SILLS

- PzZd** **Metadiorite and metadiabase, and altered rocks (Paleozoic and Neoproterozoic)**— Metamorphosed coarse-grained hornblende metadiorite, fine-grained metadiabase, greenstone containing epidosite, altered siliceous schist and ankerite-chlorite schist

## NEOPROTEROZOIC ROCKS

### Murphy Belt

- Znt** **Tusquitee Quartzite and Nantahala Formation (Neoproterozoic)**— Feldspathic quartzite containing numerous thin layers of dark-gray laminated, at places sulfidic, dark-gray slate

### Great Smoky Group

- Zd** **Dean Formation (Neoproterozoic)**— Sericite-schist containing abundant biotite and lesser staurolite and garnet porphyroblasts, interbedded with metagraywacke and quartz pebble conglomerate in middle and upper part
- Zam** **Ammons Formation (Neoproterozoic)**— Metasandstone and muscovite schist containing abundant metasilstone in the lower part. Upper part is dark-gray graphitic and sulfidic mica schist and metasilstone interbedded with metagraywacke, metasilstone, and muscovite schist, and locally metaquartzite and garnet-biotite mica schist
- Zgb** **Grassy Branch Formation (Neoproterozoic)**— Metasandstone and subordinate muscovite schist grades upward to dark-gray muscovite schist and metasandstone
- Zwe** **Wehuttty Formation (Neoproterozoic)**— Dark-gray graphitic and sulfidic schist interbedded with metagraywacke, metaconglomerate, and muscovite schist
- Zch** **Copperhill Formation (Neoproterozoic)**— Massive to coarse-grained metagraywacke and metaconglomerate interbedded with locally sulfidic quartz-garnet-muscovite phyllite and schist. Has quartz-muscovite schist and phyllite interbedded with metagraywacke (Zchs). Phyllite locally graphitic and sulfidic. schist contains porphyroblasts of garnet, kyanite, or staurolite, depending on metamorphic grade. Also contains dark-gray slaty, locally graphitic and sulfidic metasilstone, interbedded with metagraywacke (Zchsl)
- Za** **Anakeesta Formation (Neoproterozoic)**— Dark-gray graphitic sulfidic slate, metasilstone, and phyllite, containing local metasandstone and metagraywacke. Has light-gray, coarse-grained to conglomeratic metagraywacke interbedded with metasilstone (Zag), light-gray, fine-grained metasandstone, ankerite-rich metasandstone, chloritoid metasilstone, and ankeritic sandy

dolomite (Zas), thin bodies of dark-gray, fine-grained dolomite, sandy dolomite, and pisolitic dolomite (Zal), range from 1-3 ft thick; shown by x, and light-gray slate containing small dark elliptical porphyroblasts of chloritoid (Zac)

- Zc Cades Sandstone (Neoproterozoic)**— Medium- to coarse- grained feldspathic metasandstone and metagraywacke in thin to medium thick layers, interbedded with dark metasiltstone and slate; Contains local interbedded conglomerate, the clasts of which are cobbles and boulders of leucocratic granite. Resembles the thicker bedded and coarser-grained Thunderhead Sandstone. Has boulder conglomerate consisting rounded leucocratic granite in a matrix of quartz and feldspar (Zcc), and dark-gray siltstone interbedded with fine-grained metasandstone (Zcs)
- Zt Thunderhead Sandstone (Neoproterozoic)**— Thick graded beds of coarse-grained feldspathic metasandstone and metaconglomerate interbedded with dark-grayitic metasiltstone and slate. Metaconglomerate contains distinctive angular grains and pebbles of potassium feldspar, blue and gray quartz, and leucogranite. Has dark graphitic metasiltstone and slate (Zts), and boulder conglomerate (Ztb) consisting of rounded leucocratic granite clasts in a matrix of quartz and feldspar; clasts of large boulders of slate and dolomite occur locally
- Ze Elkmont Sandstone (Neoproterozoic)**— Dark-gray feldspathic and argillaceous metasandstone interbedded with dark-gray metasiltstone. Metasandstone is distinctively finer-grained, darker in color, and thinner bedded than overlying Thunderhead Sandstone. Contains coarse-grained metasandstone and metaconglomerate (Zes)

## Snowbird Group

- Zsb Snowbird Group, undivided**
- Zr Rich Butt Sandstone (Neoproterozoic)**— Thick beds of gray, fine-grained, feldspathic metasandstone interbedded with dark-gray slate, partly current bedded; minor amounts of arkosic conglomerate and intraformational breccia. Has dark-gray slate and metasiltstone interbedded with fine-grained metasandstone (Zrs)
- Zm Metcalf Phyllite (Neoproterozoic)**— Lustrous, greenish-gray chlorite-sericite phyllite and laminated metasiltstone strongly sheared contains multiple cleavages
- Zp Pigeon Siltstone (Neoproterozoic)**— Massive green and blue-green chlorite-rich, laminated metasiltstone containing minor fine-grained feldspathic metasandstone. Unit is current bedded, contains soft-sediment folds and is faulted. Primary foliation in rock is cleavage. Upper part near Dunn Creek fault contains abundant laminae of iron-bearing carbonate. Has thick-bedded fine grained feldspathic metasandstone (Zps)
- Zrf Roaring Fork Sandstone (Neoproterozoic)**— Thin-to thick- bedded, fine-grained greenish-gray feldspathic metasandstone interbedded with dark-gray chloritic metasiltstone and phyllite. Has prominent beds of fine-grained feldspathic metasandstone (Zrfs)
- Zl Longarm Quartzite (Neoproterozoic)**— Quartzite interbedded with meta-arkose, feldspathic metasandstone and quartz-mica schist. Current-bedded, light-gray quartzite
- Zwb Wading Branch Formation (Neoproterozoic)**— Quartz-mica schist and phyllite containing a lens of metaconglomerate, grades upward into metagraywacke and meta-arkosic conglomerate interbedded with sandy slate and quartz-mica schist

## MESOPROTEROZOIC ROCKS

- Ybg Biotite augen gneiss (Mesoproterozoic)**— Strongly foliated and lineated dark-gray biotite granitoid gneiss containing distinctive augen of white feldspar in the Cherokee- Raven Fork belt. SHRIMP U/Pb zircon age 1029 +3 (Southworth and Aleinikoff, in press). Contains abundant xenoliths of amphibolite
- Ygd Granodiorite (Mesoproterozoic)**— Medium-grained, mottled, greenish-gray granodiorite containing hypersthene and tan feldspar on Cove Mountain. SHRIMP U/Pb zircon age 1040 +-6 (Southworth and Aleinikoff, in press)
- Ypg Porphyritic granite (Mesoproterozoic)**— Coarse-grained granite with large porphyroblasts of feldspar and quartz intrudes hornblende-biotite gneiss in Ela dome. SHRIMP U/Pb zircon age 1056 +-8 (Southworth and Aleinikoff, in press)
- Ymp Monzogranite gneiss (Mesoproterozoic)**— Monzogranite gneiss with protomylonitic and mylonitic foliations (Carter and Wiener, 1999). Includes the foliated and lineated “border gneiss”(Cameron, 1951) on the northern margin of the Bryson City dome
- Yg Granitic gneiss (Mesoproterozoic)**— Medium- to coarse-grained, foliated biotite granite gneiss that intruded migmatitic biotite gneiss in the Bryson City dome. Has a SHRIMP U/Pb zircon age 1163 +-11 (Southworth and Aleinikoff, in press). Similar rock containing some coarse porphyroblastic potassium feldspar. Intrudes hornblende-biotite gneiss near Dellwood. Has SHRIMP U/Pb zircon age 1168 +-7 (Southworth and Aleinikoff, in press)
- Ysg Spring Creek Granitoid Gneiss (Mesoproterozoic)**— Heterogeneous biotite granitoid gneiss interlayered with biotite granodioritic gneiss, tonalitic gneiss, quartz monzodioritic gneiss, amphibolite, biotite gneiss, and biotite schist (Carter and Wiener, 1999)
- Ym Migmatitic biotite gneiss (Mesoproterozoic)**— Migmatitic biotite gneiss containing leucosomes and amphibolite. Light-gray, sugary- textured leucocratic granite gneiss leucosome with cm-wide dark clots of biotite, muscovite, and garnet has SHRIMP U/Pb zircon age 1194 +-7 (Southworth and Aleinikoff, in press). Unit also contains mylonitic biotite gneiss near Dellwood that has SHRIMP U/Pb zircon age of 1117+-14 (Southworth and Aleinikoff, in press). Correlated with the Earlies Gap Biotite Gneiss of Merschat and Wiener (1988)
- Yh Hornblende-biotite gneiss (Mesoproterozoic)**— Gray, well-layered, migmatitic hornblende-biotite-quartz-plagioclase gneiss containing amphibolite. Intimately associated with migmatitic biotite gneiss
- Ya Amphibolite (Mesoproterozoic)**— Foliated amphibole-plagioclase gneiss in pods, layers, and lens in Mesoproterozoic gneisses
- Yu Ultramafic rock (Mesoproterozoic)**— Pods of metamorphosed mafic and ultramafic rocks within Mesoproterozoic gneisses. Includes metaperidotite and metagabbro in the Bryson City dome

## EASTERN BLUE RIDGE

- PzZud Metamorphosed dunite and peridotite (early Paleozoic and Neoproterozoic)**
- Zams Biotite gneiss of the Ashe Metamorphic Suite (Neoproterozoic)**— Muscovite-biotite gneiss, locally sulfidic; interlayered and gradational with mica schist, minor amphibolite, and hornblende gneiss; intruded by trondhjemite dikes
- Ym Migmatitic biotite gneiss (Mesoproterozoic)**— Well-foliated and locally migmatitic sillimanite-grade biotite-quartz-plagioclase gneiss and biotite-hornblende gneiss; interlayered with and

gradational into biotite-garnet gneiss, calcsilicate rock, marble, and amphibolite. Correlated with the Earlies Gap Biotite Gneiss of Mersch and Wiener (1988)