

EXPLANATION & LIST OF MAP UNITS – OFR 2004-1410 v.1

EXPLANATION OF MAP UNITS (Names and symbols are in List of Map Units)

UNCONSOLIDATED SURFICIAL DEPOSITS

Alluvium (Qa) -- Unconsolidated silt, sand, cobbles, and boulders along streams, floodplains, and alluvial plains

Debris flows (Qdf) -- Debris flow scars, tracks, and deposits from modern and historic storms with high rainfall

Terrace deposits (QTt) -- Sand, gravel, cobbles, and boulders, mostly of quartz-rich rocks, deposited along most major rivers

Sinkholes (QTs) -- Sinkholes, depressions, hummocks, and clusters of sinkholes, bedrock pinnacles, and cave openings in areas underlain by carbonate bedrock

Residuum (QTr) -- Pebbles, cobbles, and small boulders of subangular chert, quartz, and jasperoid in red clay and silty soil overlying carbonate bedrock

Colluvium (Qc) -- Boulder streams, boulder fields, and talus consisting of clast-supported diamicton of angular to subrounded boulders and cobbles of quartz-rich rock

Debris (Qd) -- Fans and sheets of matrix-supported diamicton on lower slopes and valleys in the highlands, consisting of subrounded boulders, cobbles, and pebbles of massive quartz-rich rocks

SEDIMENTARY AND METASEDIMENTARY ROCKS

CARBONATE ROCKS

Carbonate rocks -- Limestone, dolomite, and calcareous siliciclastic rocks. Anakeesta Formation (Zas and Zal), Shields Formation (Zsl), Wilhite Formation (Zwl and Zwlc), Shady Dolomite (Cs and Css), Jonesboro Limestone (Oj), Tellico Formation (Ot), and Greasy Cove Formation (Mgc)

SILICICLASTIC ROCKS

Metasiltstone, shale, slate, phyllite -- Pigeon Siltstone (Zp), Metcalf Phyllite (Zm), Rich Butt Sandstone (Zrs), Anakeesta Formation (Zac), Licklog Formation (Zll), Wilhite Formation (Zw), Nichols Shale (Cn), Murray Shale (Cm), Helenmode Formation (Chm), Rome Formation (Cr), Blockhouse Shale (Obl), and Chattanooga Shale (MDC)

Quartzite, sandstone -- Longarm Quartzite (Zl), Nebo Quartzite (Cnb), Hesse Quartzite (Ch), and Upper part of the Chilhowee Group (Ccu)
Feldspathic metasandstone, conglomerate -- Elkmont Sandstone (Zes), Licklog

Formation (Zllc), and Shields Formation (Zsc)

Feldspathic metasandstone, conglomerate, slate, phyllite, metasilstone, metashale, schist -- Roaring Fork Sandstone (Zrf and Zrfs), Pigeon Siltstone (Zps), Rich Butt Sandstone (Zr), Shields Formation (Zss), Cochran Formation (Cc), Bays Formation (Ob), and Grainger Formation (Mg)

Quartz-muscovite schist -- Wading Branch Formation (Zwb) and Copperhill Formation (Zchs)

GRAPHIDIC and SULFIDIC SILICICLASTIC ROCKS

Feldspathic metasandstone, metagraywacke, conglomerate, metasilstone, slate, phyllite, schist -- Rich Butt Sandstone (Zrs), Elkmont Sandstone (Ze), Thunderhead Sandstone (Zt and Ztb), Cades Sandstone (Zc and Zcb), Anakeesta Formation (Zag), Copperhill Formation (Zch), Grassy Branch Formation (Zgb), Ammons Formation (Zam)

Metasilstone, slate, phyllite -- Thunderhead Sandstone (Zts), Cades Sandstone (Zcs), Anakeesta Formation (Za), Copperhill Formation (Zchsl), and Wehuttty Formation (Zwe)

METAMORPHOSED IGNEOUS ROCKS

Mafic and ultramafic rocks -- Metadiabase, metadiorite, greenstone (Pzd), amphibolite (Ya), and metaperidotite and metagabbro (Yu)

Felsic rocks -- Leucocratic granitic gneiss (Yl), monzogranitic gneiss (Ymp), granitic gneiss (Yg), porphyroblastic granite (Ypg), granodiorite (Ygd), and mylonitic gneiss (Ymg)

Mafic and felsic meta-igneous rocks mixed -- Migmatitic biotite gneiss (Ym), hornblende-biotite gneiss (Yh) and associated amphibolite and calc-silicate rocks, Spring Creek granitoid gneiss (Ysg), and biotite augen gneiss (Ybg) and amphibolite

LIST OF MAP UNITS

(Showing age, chronology and formational names)

PALEOZOIC ROCKS

TENNESSEE VALLEY

Mgg — Greasy Cove and Grainger Formations, undifferentiated (Lower and Upper Mississippian)

Mgc — Greasy Cove Formation (Early Late Mississippian) — Interbedded gray calcareous shale, argillaceous limestone, fine-grained sandstone, red shale, and sandstone

Mg — Grainger Formation (Lower Mississippian) — Noncalcareous siltstone and fine-grained sandstone grades upward to coarser grained feldspathic sandstone and pebble conglomerate interbedded with silty shale

MDC — Chattanooga Shale (Upper Devonian and Lower Mississippian?) — Dark carbonaceous noncalcareous shale; locally at the base is sandstone a few inches thick and sandy shale

Ob — Bays Formation (Middle Ordovician) — Red calcareous mudrock and siltstone, locally with coarse-grained feldspathic and quartzitic sandstone interbedded with red fine-grained sandstone

Ot — Tellico Formation (Middle Ordovician) — Gray sandy and silty calcareous shale with beds of calcareous sandstone, fine-grained sandstone, and impure limestone

TECTONIC WINDOWS

Obl — Blockhouse Shale (Middle Ordovician) — Dark fissile calcareous shale with local beds of sandstone in the lower part and a thin limestone locally at the base

Oj — Jonesboro Limestone (Lower Ordovician) — Light-gray limestone, laminated to thick-bedded; some interbeds of dolomite and sandy limestone (locally includes Middle Ordovician Lenoir Limestone)

WESTERN BLUE RIDGE

FOOTHILLS

Cr — Rome Formation (Middle Cambrian) — Maroon shale, siltstone, and sandstone

Cs — Shady Dolomite (Lower Cambrian) — Thick-bedded dolomite

Css — Shaly dolomite

CHILHOWEE GROUP

Ccu — Upper part of Chilhowee Group, undifferentiated (Early Cambrian) — Quartzite, shale, and coarse sandstone, undifferentiated

Chm — Helenmode Formation (Early Cambrian) — Gray shale with beds of sandstone and quartzite

Ch — Hesse Quartzite (Early Cambrian) — Thick-bedded white quartzite

Cm — Murray Shale (Early Cambrian) — Greenish-gray shale

Cnb — Nebo Quartzite (Early Cambrian) — Thin-bedded white quartzite containing Skolithus burrows

Cn — Nichols Shale (Early Cambrian) — Greenish-gray shale with some thin beds of sandstone and quartzite

Cc — Cochran Formation (Early Cambrian) — Basal gray conglomerate, overlain by maroon pebbly arkose interbedded with maroon shale and siltstone; grades upward into light-gray arkose, sandstone, and quartzite

NEOPROTEROZOIC ROCKS

WALDEN CREEK GROUP

Zw — Wilhite Formation (Neoproterozoic) — Variegated shale, siltstone, metasiltstone, and slate

Zwl — Limestone and shale

Zwlc — Carbonate and clastic rocks — Thin beds of limestone and sandy limestone within shale

Zsh — Shields Formation (Neoproterozoic) — Dark-gray to greenish-gray laminated siltstone and slate

Zsl — Limestone and siltstone

Zss — Coarse sandstone and siltstone

Zsc — Conglomerate — Polymictic conglomerate of pebbles and cobbles, interbedded with pebbly sandstone

Zll — Licklog Formation (Neoproterozoic) — Siltstone and shale

Zllc — Conglomeratic sandstone

HIGHLANDS

PALEOZOIC DIKES AND SILLS

Pzp — Pegmatite (Paleozoic) — Tabular, lenticular, irregular bodies of pegmatite consist of plagioclase, perthite, quartz, muscovite, and biotite. Sizes range from 1 in. thick and 12 in. long to 210 ft. thick and 490 ft. long

Pzd — Metadiorite and metadiabase, and related rocks (Paleozoic) — Metamorphosed coarse-grained hornblende metadiorite, fine-grained foliated metadiabase, greenstone with epidosite, altered siliceous schist and ankerite-chlorite schist

NEOPROTEROZOIC ROCKS

GREAT SMOKY GROUP

Zam — Ammons Formation (Neoproterozoic) — Metasandstone and muscovite schist interbedded with abundant metasiltstone in the lower part. Upper part is dark graphitic and sulfidic mica schist and metasiltstone, interbedded with metagraywacke, metasiltstone, muscovite schist, and locally metaquartzite and garnet-biotite porphyroblastic mica schist

- Zgb — Grassy Branch Formation (Neoproterozoic) — Metasandstone with subordinate muscovite schist and metagraywacke grades upward to dark porphyroblastic muscovite schist and metasandstone
- Zwe — Wehuty Formation (Neoproterozoic) — Dark graphitic and sulfidic schist interbedded with metagraywacke, metaconglomerate, and muscovite schist
- Zch — Copperhill Formation (Neoproterozoic) — Massive and coarse metagraywacke and metaconglomerate interbedded with quartz-garnet-muscovite phyllite and schist; locally sulfidic
- Zchs — Quartz-muscovite schist — Quartz-muscovite schist and phyllite interbedded with metagraywacke. Phyllite locally graphitic and sulfidic. Schist contains porphyroblasts of garnet, kyanite, or staurolite, corresponding to metamorphic grade
- Zchsl — Slaty metasiltstone — Dark slaty metasiltstone, locally graphitic and sulfidic, interbedded with metagraywacke
- Za — Anakeesta Formation (Neoproterozoic) — Dark graphitic and sulfidic slate, metasiltstone, and phyllite, with local beds of thin metasandstone and metagraywacke
- Zag — Metagraywacke — Light-gray, coarse-grained to conglomeratic metagraywacke interbedded with metasiltstone
- Zas — Metasandstone and siliceous metasiltstone — Light gray, fine-grained metasandstone, ankeritic metasandstone, chloritoid metasiltstone, and ankeritic sandy dolomite
- Zal — Metalimestone and metadolomite — Thin dark bodies of fine-grained dolomite, sandy dolomite, and pisolitic dolomite, ranging from 1 to 3 ft. thick; shown by x
- Zac — Chloritoid slate — Light-gray slate with thin dark elliptical porphyroblasts of chloritoid
- 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 conglomeratic interbeds of cobbles and boulders of leucocratic granite. Resembles the thicker bedded and coarser grained Thunderhead Sandstone
- Zcb — Boulder conglomerate — Boulder conglomerate of rounded leucocratic granite in a matrix of quartz and feldspar
- Zcs — Dark metasiltstone — Dark metasiltstone interbedded with fine-grained metasandstone
- Zt — Thunderhead Sandstone (Neoproterozoic) — Thick beds of graded, coarse-grained feldspathic metasandstone and metaconglomerate, interbedded with dark graphitic metasiltstone and slate. Metaconglomerate consists of distinctive angular grains and pebbles of potassium feldspar, blue and gray quartz, and leucogranite
- Zts — Dark metasiltstone — Dark graphitic metasiltstone and slate

Ztb — Boulder conglomerate — Boulder conglomerate of rounded leucocratic granite in a matrix of quartz and feldspar; large boulders of slate and dolomite occur locally

Ze — Elkmont Sandstone (Neoproterozoic) — Dark feldspathic and argillaceous metasandstone interbedded with dark metasilstone. Metasandstone distinctively finer grained, darker, and thinner bedded than overlying Thunderhead Sandstone

Zes — Coarse metasandstone — Coarse-grained metasandstone and metaconglomerate

SNOWBIRD GROUP

Zrb — Rich Butt Sandstone (Neoproterozoic) — Thick beds of gray, fine-grained feldspathic metasandstone interbedded with dark slate, partly current bedded; minor amounts of arkosic conglomerate and intraformational breccia

Zrs — Metasilstone — Dark slate and metasilstone interbedded with fine-grained metasandstone

Zm — Metcalf Phyllite (Neoproterozoic) — Lustrous, greenish-gray chlorite-sericite phyllite and laminated metasilstone; strongly sheared with multiple cleavages

Zp — Pigeon Siltstone (Neoproterozoic) — Massive, green and blue-green, chlorite-rich laminated metasilstone with minor fine-grained feldspathic metasandstone. Laminations show current bedding, soft-sediment folds and faults. Primary foliation in rock is cleavage. Upper part near Dunn Creek fault contains abundant laminae of iron-bearing carbonate and clasts of limestone

Zps — Metasandstone — Thick beds of fine-grained feldspathic metasandstone

Zs — Roaring Fork Sandstone, Longarm Quartzite, and Wading Branch Formation, undivided (Neoproterozoic)

Zrf — Roaring Fork Sandstone (Neoproterozoic) — Thin to thick beds of fine-grained, greenish-gray, feldspathic metasandstone interbedded with dark chloritic metasilstone and phyllite

Zrfs — Metasandstone — Prominent beds of fine-grained feldspathic metasandstone

Zl — Longarm Quartzite (Neoproterozoic) — Quartzite interbedded with meta-arkose, feldspathic metasandstone and quartz-mica schist. Light-gray quartzite displays prominent crossbeds

Zwb — Wading Branch Formation (Neoproterozoic) — Quartz-mica schist, phyllite, and local metaconglomerate; grades upward into metagraywacke and meta-arkosic conglomerate interbedded with sandy slate and quartz-mica schist

MESOPROTEROZOIC ROCKS

Ymg — Mylonitic gneiss (Mesoproterozoic) — Strongly foliated and lineated biotite granitic gneiss with augen of pink feldspar; forms the “border gneiss”(Cameron, 1951) on the north and west margin of the Bryson City dome

- Ybg — Biotite augen gneiss (Mesoproterozoic) — Strongly foliated and lineated dark biotite granitoid gneiss with distinctive augen of white feldspar in Cherokee-Raven Fork belt. SHRIMP U/Pb zircon age of 1,029 \pm 3 Ma (Southworth and Aleinikoff, in press). Contains abundant xenoliths of amphibolite
- Ygd — Granodiorite (Mesoproterozoic) — Medium-grained, mottled greenish-gray granodiorite with hypersthene and tan feldspar on Cove Mountain. SHRIMP U/Pb zircon age of 1,040 \pm 6 Ma (Southworth and Aleinikoff, in press)
- Ypg — Porphyroblastic granite (Mesoproterozoic) — Coarse-grained granite with large porphyroblasts of feldspar and quartz intrudes hornblende-biotite gneiss in Ela dome. SHRIMP U/Pb zircon age of 1,056 \pm 8 Ma (Southworth and Aleinikoff, in press)
- Yg — Granitic gneiss (Mesoproterozoic) — Medium- to coarse-grained, foliated biotite granitic gneiss that intrudes migmatitic biotite gneiss in the Bryson City dome has a SHRIMP U/Pb zircon age of 1,163 \pm 11 Ma (Southworth and Aleinikoff, in press). Similar rock with some coarse porphyroblastic augen of potassium feldspar intrudes hornblende-biotite gneiss near Dellwood and has a SHRIMP U/Pb zircon age of 1,168 \pm 7 Ma (Southworth and Aleinikoff, in press)
- Ymp — Monzogranitic gneiss (Mesoproterozoic) — Monzogranitic gneiss with protomylonitic and mylonitic foliations (Carter and Wiener, 1999)
- Ysg — Spring Creek Granitoid Gneiss (Mesoproterozoic) — Heterogeneous biotite granitic gneiss interlayered with biotite granodioritic gneiss, tonalitic gneiss, quartz monzodioritic gneiss, amphibolite, biotite gneiss, and biotite schist (Carter and Wiener, 1999)
- Yl — Leucocratic granitic gneiss (Mesoproterozoic) — Light-gray, sugary textured granitic gneiss with centimeter-wide dark clots of biotite, muscovite, and garnet; forms leucosomes in migmatitic biotite gneiss in southern part of Bryson City and Ela domes. SHRIMP U/Pb zircon age 1,194 \pm 7 Ma (Southworth and Aleinikoff, in press)
- Ym — Migmatitic biotite gneiss (Mesoproterozoic) — Migmatitic biotite gneiss containing leucosomes and amphibolite
- Yh — Hornblende-biotite gneiss (Mesoproterozoic) — Gray, well-layered, hornblende-biotite-quartz-plagioclase gneiss. Contains amphibolite, leucosomes, and is migmatitic
- Ya — Amphibolite (Mesoproterozoic) — Foliated amphibole-plagioclase gneiss as pods, layers, and lenses in Mesoproterozoic gneisses
- Yu — Ultramafic rock (Mesoproterozoic) — Pods and bodies of metamorphosed mafic and ultramafic rocks within Mesoproterozoic gneisses. Includes metaperidotite and metagabbro in the Bryson City dome