US 76: Chatsworth – South Carolina Line

115 miles

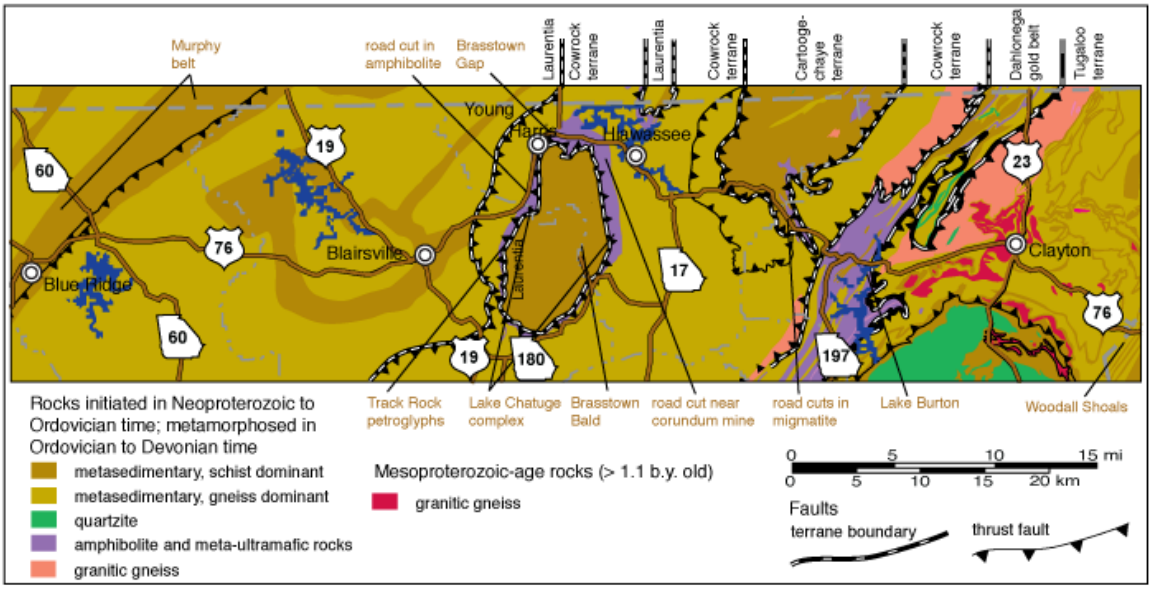
US 76 crosses the Blue Ridge thrust fault into the Blue Ridge 24 miles east of I-75, and 3.2 miles east of US 411, about 300 yards east of a small exposure of carbonate rocks of probable Cambrian age. The Blue Ridge rocks to the east and above the thrust fault have moved more than 100 miles westward over the Valley and Ridge rocks. On the north side of US 76, 300 yards east of the unexposed fault trace, is a long road cut exposing Proterozoic or early Paleozoic-age dark gray to black, carbon-bearing slate, phyllite, and metagraywacke, which weather to a rusty orange color. Gold-colored specks of pyrite ("fool's gold") are visible in freshly broken rock. The pyrite and carbon are evidence that the original sediments were deposited in an oxygen-poor environment, where decomposing bacteria produced sulfur as a byproduct. As the rocks are exposed to air, the iron in pyrite produces iron oxide or rust, accounting for the orange staining. Unfortunately, the sulfur reacts with water to form sulfuric acid, which can cause fish kills downstream in severe cases. This process sometimes occurs naturally, such as when rock slides in the Smokies expose rocks with pyrite or other sulfide minerals. Beds of metagraywacke up to 6 feet thick have graded bedding, and were probably deposited in deep water by turbidity currents.

Georgia Geological Society field trip examines rusty-weathering dark slate and metagraywacke along US 76.

Biotite is present in these rocks, and similar rocks about a mile to the east contain garnet, and farther east, near Ellijay, staurolite is present. This pattern of minerals indicates progressively higher temperatures of metamorphism and increasing depth of burial toward the east. The metagraywacke and dark slate here can be traced north to GA 52 and south to excellent exposures on the road from GA 136 to Carters Dam. Dark, pyrite-bearing slate and phyllite, deposited in deep, oxygen-poor water, are present at many places in the Blue Ridge.

Ellijay lies in the Murphy belt, which coincides with the valley followed by I-575, GA 5/515, and, in North Carolina, parts of US 64 and US 19. The rocks of this belt overlie the Ocoee Supergroup, and are likely Cambrian to Ordovician in age. Murphy Belt rocks are dominated by metagraywacke and schist. There is also quartzite underlying ridges,

and the famous Georgia marble. The Murphy belt is discussed further in the GA 5 road guide. US 76 follows GA 5 between Ellijay and the town of Blue Ridge. About 5 miles east of Blue Ridge, US 76 crosses the boundary between the Murphy belt on the west and the Late Proterozoic-age Great Smoky Group on the east. These rocks contain the mineral kyanite, indicating higher temperatures of metamorphism than the minerals in the rocks west of Ellijay.



Geology along US 76 east of Murphy Belt (see GA 52 map for western part of route). Modified after Thigpen and Hatcher (2009).

Blairsville to Hiawassee

About 5 miles east of Blairsville, US 76 crosses the thrust fault that places the Cowrock terrane rocks to the east on top of Laurentian rocks. The metasedimentary rocks, mainly gneiss and schist, of the Cowrock terrane are thought to have been deposited on the seafloor, some of which is preserved in the Lake Chatuge mafic-ultramafic complex. This roughly oval belt of rocks surrounds Georgia's highest point, Brasstown Bald (4784 feet). The northward bend in US 76 in this area traces close to the northern end of the oval of the Lake Chatuge complex and provides access to exposures of it. Brasstown Bald, which is part of the prominent ridge southeast of US 76, along with the antiform

(upfold) that caused the oval outline of the Lake Chatuge complex, is discussed in the US 19 road guide.

Track Rock Archaeological Site

Former mantle rocks, which make up the ultramafic part of the Lake Chatuge complex, are best seen at the Track Rock Archaeological Site, where Indians carved symbols into them. Directions: Turn south from US 76 onto Track Rock Gap Road, 6.6 miles east of the US 129 intersection in Blairsville, and continue 2.2 miles south, to parking for the archeological site on the west side of the road.

Leaf shape carved in soapstone boulder (protected from further carving by grate) at Track Rock.

Track Rock is talc-chlorite schist, a gray-green, compact but soft rock, called soapstone, because it has a soapy feel and is easily carved. You can see boulders of soapstone across the road and weathered rock in small road cuts just to the south. Before

metamorphism, the soapstone was an ultramafic (iron and magnesium-rich, silica-poor) rock, typical of rocks that originated in Earth's mantle. The petroglyphs, or carvings in the rock include leaf or moccasin shapes. A grate has been placed over the best carvings to prevent vandalism.

You can see amphibolite on the northwest side of US 76 at the intersection of Swanson Road, 1.3 miles east of the Track Rock Gap Road intersection. Black, rusty-weathering amphibolite and metagabbro, that were probably part of the oceanic crust overlying the soapstone mantle rocks, are exposed along US 76. The black color is due to the presence of iron-rich metamorphic minerals, such as hornblende. The rocks probably begun as basalt erupted along a mid-ocean ridge, or as diabase and gabbro in the "plumbing" of magma chambers and dikes that supplied the erupting lava. These rocks make up most of the Lake Chatuge complex.

US 76 climbs to cross the low north end of Brasstown Bald's ridge at Brasstown Gap, 2.7 miles east of Young Harris. In and near the gap, on both sides of the road, are exposures of metasedimentary rocks, most likely deposited on the oceanic crust rocks of the Lake Chatuge complex. These include intensely folded biotite gneiss, cut by a granitic intrusion that weathers to white crumbly rock.

Two exposures of the rocks of the Lake Chatuge Complex on the Hiawassee side of the ridge are worth noting. On the north side of US 76, at the east end of Ridgecrest Circle and 4.9 miles east of Young Harris, is colorful weathered rock in layers of yellow-brown and gray that dip northward, mapped as part of the amphibolite and metagabbro unit. Less weathered, east-dipping amphibolite, is exposed a mile south of US 76. Turn south onto GA 288, 5.7 miles east of Young Harris, and continue 1.0 miles to Hog Creek Road on the right. The outcrop is on the north side of Hog Creek Road within view of the intersection. This outcrop is less than half a mile southeast of the now covered Hog Creek Corundum Mine. Corundum (aluminum oxide) is associated with the amphibolite and metagabbro, both here and north of Franklin, North Carolina. Red, clear corundum crystals are called ruby, and blue crystals (or other colors) are sapphire. Both have been

found in the area, and can be found by panning gravel from local streams or the lakeshore. Panning for corundum is possible because it is 1.4 times as dense as quartz, the main constituent of typical gravel. You could not separate amethyst or agate by panning, because both are forms of quartz and have the same density. Corundum is the second hardest mineral known (after diamond), and was once mined in this area for use as an abrasive, in products such as emery board.

Hiawassee to Lake Burton

US 76 crosses the Chunky Gal Mountain-Shope Fork fault at the east end of Lake Chatuge, about 4 miles east of Hiawassee. This thrust fault carries the Cartoogechaye (Car-TOO-ga-jay) terrane, which is about 60 miles long and from 2 to 11 miles wide, extending northeastward to near Waynesville, NC. A long road cut exposes migmatite, or gneiss that has partially melted into granite, one mile east of the Towns/Rabun county line (11.6 miles east of Hiawassee). The rocks consist of biotite gneiss and schist that have been deformed into folds with many orientations and shapes. The gneiss and schist have irregular white patches of quartz and feldspar that have a texture similar to granite. This patchy texture suggests that the biotite gneiss and schist were partially melted, producing magma that cooled to form granite-like rock.

Blocks of migmatite along US 76, each about 20 inches long.

In the mountains about 5 miles north of the US 76 migmatite outcrop are at least two amethyst mines, now exhausted and off limits. (The Forest Service, concerned by the erosion resulting from digging, has fined would-be collectors.) Amethyst is a beautiful purple variety of quartz, and you can see a fine collection of amethyst from the Charlie Creek mine at the Tellus Museum in Cartersville.

The thrust faults bounding both the Cowrock and the Cartoogechaye terranes have been down-folded into a synform, the core of which is close to the mountain crest followed by the Towns-Rabun county line and the Appalachian Trail. A mile east of the migmatite exposure and Lake Burton, US 76 crosses a west-dipping part of the Chunky Gal Mountain- Shope Fork fault and reenters the Cowrock terrane. US 76 exits the Cowrock terrane 2.5 miles farther east, crossing a west-dipping part of the Hayesville-Soque River fault (pronounced “soak”), first encountered east of Blairsville.

The rocks beneath the Hayesville-Soque River fault in this area, along Lake Burton and GA 197, are part of the Dahlonega gold belt. Lake Burton preserves the name of one of the earliest Georgia gold rush towns, now underwater, near Moccasin Creek State Park, about 3 miles southwest of the US 76 bridge over Lake Burton. In addition to gold-bearing volcanic rocks, the Dahlonega belt contains ultramafic (mantle-related) and mafic (originally basalt-like) rocks. A number of now-exhausted mineral deposits are associated with these rocks: a corundum mine near Tate City, as well as asbestos, talc, soapstone, and vermiculite mines around Lake Burton. The term asbestos refers to minerals that are fibrous enough to be woven into cloth. Anthophyllite is the asbestos mineral in this area. Asbestos was popular for many years in making suits for firefighters and also as a non-flammable building material, but unfortunately, asbestos fibers can lodge in tiny passageways in the lung, causing fatal lung ailments, so it is now been banned from most building uses.

Lake Burton to Woodall Shoals

US 76 crosses the Chattahoochee fault 3.2 miles east of the Lake Burton bridge, exiting the Dahlonega gold belt and entering the Tugaloo terrane. In the seven miles between the Chattahoochee fault trace and the town of Clayton, US 76 follows a valley with a straight course that is prominent on satellite images. This feature is the Warwoman lineament, extending northeastward from west of Lake Burton to near the South Carolina border. Detailed mapping reveals that several rock units cross the lineament without offset, so it is probably not a fault. It roughly separates Tugaloo terrane geology, dominated by the Rabun Gneiss to the north, from that dominated by the Tallulah Falls Dome to the south.

The Rabun Gneiss, a metamorphosed granite, is exposed along the north side of US 76, about 5.2 miles east of the Lake Burton bridge. Rabun Gneiss intruded into surrounding rocks between 374 and 335 million years ago, and forms a body more than 20 miles long and in places more than 2 miles wide. Such bodies of granitic gneiss are common in the Tugaloo terrane and terranes to the southeast.

East of Clayton, US 76 passes several weathered exposures of gneiss, schist, and amphibolite of the Tugaloo terrane. The easternmost of these in Georgia is north of the bridge at the South Carolina line across the Chattooga River. The Chattooga is a National Wild and Scenic River popular for whitewater boating, and is famous as the river where *Deliverance* was filmed. This section of river was once the upper reaches of the Chattahoochee River, until Savannah River tributaries captured its flow. The steepened slope of the river after capture created the challenging whitewater rapids.

A river outcrop about two miles downstream from the bridge, known as Woodall Shoals, has been called the "Rosetta Stone" for geologic structure in this part of the Appalachians. Access to the outcrop is on the South Carolina side of the Chattooga. The groundbreaking work of Dr. Robert Hatcher in the 1970's on the geology of Woodall Shoals is elegantly described for the non-geologist in *Exploring the Geology of the Carolinas,* by Kevin Stewart and Mary-Russell Roberson. You might wonder why a rock outcrop might be compared to the Rosetta Stone, a tablet engraved in three systems of writing that led to the decipherment of Egyptian hieroglyphics. A complexly deformed region contains several generations of folds, each recording an event of compression such as might be associated with movement on a major fault, or, on a larger scale, a stage in the collision of two landmasses. In this area the fold generations were particularly difficult to sort out because large exposures are few, and also because one set of folds can obscure a previous set. However, at Woodall Shoals, an 8000-square-foot outcrop at one of the most challenging stretches of the whitewater run on the Chattooga, Hatcher was able to identify between five and seven different generations of folds. By tying these folds to regional folding patterns, he was able to explain the sequence of events in the area, which began during in Ordovician time and progressed until Permian time.