PREPARED IN COOPERATION WITH

TENNESSEE VALLEY AUTHORITY

STATE OF NORTH CAROLINA
DEPARTMENT OF NATURAL RESOURCES AND COMMUNITY DEVELOPMENT

Stephen G. Conrad, *State Geologist*

GEOLOGIC MAP PRENTISS QUADRANGLE, NORTH CAROLINA GM 167-SW

Base topographic map by USGS-TVA 1946. Photorevised by TVA 1978

Geologic map cartography and printing by TVA

1000-meter Universal Transverse Mercator Grid ticks, zone 17, shown in blue

10,000-foot grid based on North Carolina coordinate system

UTM GRID AND 1980 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

SCALE 1:24 000

CONTOUR INTERVAL 40 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

QUADRANGLE LOCATION

Geology mapped in 1974-1979. Assistance and cooperation of personnel of the U.S. Forest Service, during mapping of the Coweeta Hydrologic Laboratory, is gratefully acknowledged

Map preparation and editing by R. D. Hatcher, Jr., R. J. Floyd, L. S. Wiener, and C. E. Merschat

MAP UNITS

QUATERNARY
- Qal — Alluvium
- Qc — Colluvium and talus
- Qcal — Alluvium, colluvium, and talus, undifferentiated
- QTu — Undifferentiated surficial deposits

TERTIARY AND QUATERNARY
- QTt — Terrace deposits

LOWER TO MIDDLE PALEOZOIC
- t — Trondhjemite

UPPER PRECAMBRIAN OR LOWER PALEOZOIC
- um — Ultramafic rocks
- am — Amphibolite and hornblende gneiss
- ck — Mafic-ultramafic complex of Carroll Knob area
- ckg — Metagabbro unit
- ckum — Carroll Knob ultramafic unit
- g — Melagabbro and pyroxenite
- Coweeta Group
  - crp — Ridgepole Mountain Formation
  - ccr — Coleman River Formation
  - cpc — Persimmon Creek Gneiss

UPPER PRECAMBRIAN
- mss — Metasandstone and schist
- q — Quartzite
- tf — Tallulah Falls Formation
- ssg — Sillimanite schist and gneiss

DESCRIPTIONS OF ROCK UNITS

Qal ALLUVIUM—Unconsolidated stream deposits of boulders, cobbles, pebbles, sand, silt, and clay. Some of the sands and gravels are crossbedded. Pebbles, cobbles, and boulders in many streams with steep gradients are imbricated, such that the clasts are inclined upstream. Includes some lower terraces and merges upslope in many areas with colluvium. Thicknesses range from less than 1 m to as much as 10 m in narrow valleys with considerable fill. Only larger bodies mapped.

Qc COLLUVIUM AND TALUS—Unconsolidated, poorly sorted masses of material ranging from large boulders to clay. Occurs on slopes underlain by all rock units except those in which schist is dominant; also common as valley fill. Thickness ranges from a thin veneer (less than 25 cm) to more than 3m. Only larger bodies mapped.

Qcal ALLUVIUM, COLLUVIUM AND TALUS, UNDIFFERENTIATED—Unconsolidated valley fill or hillside surficial material deposited by streams or mass movement processes.

QTt TERRACE DEPOSITS—Unconsolidated stream deposits of cobbles, pebbles, sand (quartzose to micaceous to quartzo-feldspathic and micaceous, massive to crossbedded), silt and clay (tan to light-gray to medium-dark-gray and organic-rich). Several sets of terrace deposits exist along the Little Tennessee River and its tributaries; few are paired. Older (higher elevation) terraces characteristically contain thoroughly weathered cobbles and pebbles of vein quartz. Other lithologies, such as metagraywacke, survive in younger terraces. Thicknesses range from less than 25 cm to more than 2 m.

QTu UNDIFFERENTIATED SURFICIAL DEPOSITS—Unconsolidated transported material. Includes alluvium, colluvium and talus, and terrace deposits as described above.

t TRONDHJEMITE—Compact, fine- to medium-grained dikes or sills having a maximum thickness of 1 m (outcrop width exaggerated on map). Trondhjemite is light gray to white; contains subhedral to euhedral phenocrysts of zoned, Carlsbad-twinned plagioclase as large as 2 mm in a groundmass of vermicular or symplectic plagioclase-quartz. The plagioclase is sodic oligoclase. Accessory minerals are biotite, muscovite, epidote, zircon, and opaques. Soils produced from these bodies are light gray to light tan. Most of the bodies are nearly vertical and appear to be undeformed.

g MELAGABBRO AND PYROXENITE—Coarse to very coarse grained metamorphosed melagabbro/pyroxenite occurs as a single small body (N.C. coordinates 529,650N., 663,000E.). Melagabbro is composed of augite, plagioclase (An_{50-70}), chlorite, muscovite, sphene and opaque minerals. Pyroxenite contains no plagioclase. Melagabbro displays spheroidal weathering. Soil produced by this body is brown.

um ULTRAMAFIC ROCKS—Pods and irregularly shaped masses, as much as 200 m wide, of dunite and other peridotites and their metamorphosed equivalents. Mostly represented by dunite (polygonal olivine with a composition of Fo_{88-93}, minor bronzitic enstatite, and chromite), soapstone (talc, chlorite, antigorite, tremolite, minor opaque minerals), small quantities of anthophyllite, chlorite, and some serpentinite. Weather to clayey soils that are commonly thin and support a starved flora.

am AMPHIBOLITE AND HORNBLENDE GNEISS—Massive to distinctly layered amphibolite and hornblende gneiss; occur as interlayers in other rock units and as discrete bodies as much as several hundred meters thick. Only the larger bodies are mapped. Amphibolite is moderately to well foliated and dark greenish gray to greenish black; contains hornblende, plagioclase (An_{30-40}), epidote, clinozoisite, and quartz, with minor chlorite, sphene, and opaque minerals. Hornblende gneiss is poorly to moderately foliated and medium to dark gray; composed of plagioclase (An_{30-50}), hornblende, biotite, and quartz, with minor sphene and opaque minerals. The amphibolite was likely derived from metabasalt or melagabbro; the hornblende gneiss from melediorite or leucogabbro. The amphibole-rich rocks weather to a distinctive orange ochre soil.

ck MAFIC-ULTRAMAFIC COMPLEX OF CARROLL KNOB AREA—Large, irregularly shaped, polyphase-deformed bodies. The dominant rock types are amphibolite and hornblende gneiss, derived from the original mafic rocks of the complex and having compositions similar to the amphibolite and hornblende gneiss unit (am) described above. Amphibolites with plagioclase in the range An_{50-60} are common; garnet-bearing amphibolites are also present but are less common. Other rock types observed include metadiorite through metagabbro to dunite and other peridotites, as well as their altered equivalents. Textures of all these rocks range from fine to coarse grained.

ckg Metagabbro unit—Coarse-grained metagabbro, composed of labradorite and hornblende after pyroxene with minor relict pyroxene. Relict gabbroic texture, with plagioclase crystals as large as 2 cm, can be seen locally.

ckum Carroll Knob ultramafic unit—Dunite, soapstone, and serpentinite; similar to the ultramafic rock unit (um) previously described. Also contains wehrlite.

COWEETA GROUP[1]—The Coweeta Group includes the Ridgepole Mountain Formation, Coleman River Formation, and Persimmon Creek Gneiss.

crp RIDGEPOLE MOUNTAIN FORMATION[1]—Coarse biotite-garnet schist, pelitic schist, metaorthoquartzite, garnetiferous metasandstone, and muscovite-chlorite quartzite, in various proportions in different parts of the outcrop area. Quartzite and garnetiferous rock types are characteristic. Biotite-garnet schist occurs in thin (1-10 cm) to thick (1-3 m) layers and is well foliated, dark gray, and coarse grained; contains brown biotite, muscovite, highly deformed poikiloblastic garnet as large as 5 cm, quartz, chlorite (retrogressive after biotite and garnet), and plagioclase (An_{20-30}). Pelitic schist is silvery gray to light gray and well foliated, occurs in thin to thick layers; contains muscovite, biotite, garnet (poikiloblastic, anhedral, fractured), subhedral kyanite, quartz, poikiloblastic staurolite, plagioclase (An_{20-30}), chlorite after biotite, and opaque minerals. Metaorthoquartzite is white to tan, poorly to well foliated; occurs in layers 25 cm to 1½ m thick; composed of polygonal quartz (70-80 percent), muscovite, biotite, plagioclase (An_{20-25}), garnet (skeletal, irregularly shaped anhedral grains), epidote-clinozoisite (some overgrowing grains of detrital allanite; all irregularly shaped and anhedral), poikiloblastic staurolite, chlorite after biotite, and opaque minerals. Metaorthoquartzite is commonly interlayered with biotite-garnet schist. Garnetiferous metasandstone is light to medium gray; similar in composition to metaorthoquartzite, but has less quartz, with a concomitant increase in the amount of mica, garnet, staurolite, and epidote; some layers exhibit a thin-laminated (pinstriped) structure. Muscovite-chlorite quartzite is distinguished by a lesser amount of garnet and staurolite. All rock types except biotite-garnet schist weather to light-colored (tan to gray to brownish-orange) soil. Biotite-garnet schist weathers to reddish-orange soil in areas where it occurs at low elevations on gentle slopes.

ccr COLEMAN RIVER FORMATION—Characterized by metasandstone and quartz-feldspar gneiss (meta- arkose?), with subordinate amounts of interlayered pelitic schist and calc-silicate quartzite. Metasandstone and quartz-feldspar gneiss are light gray to grayish tan, moderately foliated, and occur in layers as much as 1 m thick; consist of different proportions of quartz (higher in metasandstone; lower in quartz-feldspar gneiss), plagioclase (An_{20-30}), green and brown biotite, epidote, chlorite after biotite, and garnet (skeletal, poikiloblastic, anhedral), with minor amounts of zircon and magnetite. Many metasandstone layers exhibit a "pinstriped" structure consisting of thin laminations of quartz-rich, biotite-poor material alternating with quartz-poor, mica- rich material. Because these laminations commonly are not parallel to the dominant foliation, they represent an earlier S-surface that has not been transposed. Interlayers of pelitic schist are light silvey gray and well foliated; contains muscovite, biotite, kyanite (subhedral, fractured), staurolite (anhedral to subhedral, poikiloblastic), quartz, garnet, and plagioclase (An_{20-25}), with minor epidote, zircon, and opaque minerals. Calcsilicate quartzite occurs in massive, poorly foliated layers as much as 25 cm thick and is composed of quartz, plagioclase (An_{30}), epidote, clinozoisite, subhedral to anhedral garnet, and hornblende. Rocks of this formation weather to light-orange to tan to reddish-orange soils.

[1]A thick sequence of rocks which extends from the central part of the Prentiss quadrangle southwestward along strike some 30 kilometers or more was named the Coweeta Group by Hatcher (1974, 1976, 1979). The Group name is taken from exposures along the upper reaches of Coweeta Creek and its tributaries in the Prentiss quadrangle within the Coweeta Hydrologic Laboratory south of Franklin, North Carolina. It is in this area where the large syncline that preserves the Coweeta Group reaches its greatest width.

The type areas for the basal Persimmon Creek Gneiss and the overlying Coleman River Formation are located a few miles south of the Prentiss quadrangle (Hatcher, 1979). The type exposures of the uppermost unit, the Ridgepole Mountain Formation, are on the crest and upper flanks of Ridgepole Mountain and adjacent Little Ridgepole Mountain in the southwest part of the Prentiss quadrangle (Hatcher, 1979).

The base of the Coweeta Group lies with evident conformity on the metasandstone and schist unit (mss) mapped herein. Contacts between the formations comprising the Group are also conformable; however, the original top of the Ridgepole Mountain Formation is absent because of erosion or faulting and has not been observed anywhere in this area. Precise determination of the original thickness of the Coweeta Group or of its individual formations is impossible because of transposition and other penetrative deformational processes. The total preserved thickness, based upon outcrop width and average dip, is estimated to be about 2,000 to 4,000 m.

cpc PERSIMMON CREEK GNEISS—Dominantly massive quartz diorite gneiss with interlayers (especially in the upper third of the formation) of metasandstone, quartz-feldspar gneiss, and pelitic schist. Quartz diorite gneiss is light gray to grayish white, characteristically massive coarse grained, and poorly foliated; composed of plagioclase (An_{18-25}), quartz, and green biotite with accessory muscovite, clinozoisite-epidote, chlorite after biotite, garnet (skeletal, poikiloblastic, deformed), and opaque minerals; individual layers are as much as 4 m thick. Metasandstone and quartz-feldspar gneiss occur as interlayers from 10 cm to 1 m thick, light gray, moderately foliated; composed of quartz, plagioclase (An_{20-30}), biotite, epidote, chlorite after biotite, and garnet, with minor zircon and opaque minerals. The metasandstone contains a higher proportion of quartz than does the quartz-feldspar gneiss. Pelitic schist is well foliated, light silvery gray, and is composed of muscovite, biotite, kyanite (subhedral, fractured), staurolite (subhedral, poikiloblastic), quartz, garnet (poikiloblastic, subhedral to anhedral, fractured), and plagioclase (An_{20-25}), with minor zircon, epidote, and opaque minerals; interlayers range from only a few millimeters up to 25 cm in thickness. The massive nature of the quartz diorite gneiss gives rise to large exfoliation surfaces or steep mountainsides. The quartz diorite gneiss forms light gray "salt-and-pepper" saprolite, which yields light-grayish-tan to light-gray soil. The interlayered metasandstone yields light-orange-tan to orange soil.

q QUARTZITE—Massive metaorthoquartzite is characteristic; also contains metagraywacke and metaconglomerate (?), and minor interlayers of pelitic schist and calc-silicate quartzite. Individual layers attain a maximum thickness of 1 to 1½ m. The metaorthoquartzite is medium to coarse grained, poorly to moderately foliated, and light orange tan to white. The dominant mineral is quartz (polygonal, with some later unrecovered strain) with minor amounts of muscovite, green biotite (partially replaced by chlorite), plagioclase (An_{15-30}), and garnet (subhedral, poikiloblastic). Microcline and opaque minerals are also present. The proportions of biotite, plagioclase, and muscovite locally increase such that some layers grade to metagraywacke. In the metaorthoquartzite and metagraywacke microcline varies inversely with mica. Metaconglomerate (?) contains clasts (?), as large as 5 mm, of polygonal quartz in a matrix of quartz and abundant muscovite with minor plagioclase and garnet. Calc-silicate quartzite constitutes a small portion of the unit; it occurs as layers as much as 25 cm thick. It is compact, fine to medium grained, and light to medium gray; and is composed of quartz, plagioclase, hornblende, epidote, and garnet with minor sphene, zircon, and carbonate. Soils overlying the quartzite unit are mostly light colored, but may range from reddish orange to light tan. The original thickness is unknown because of transposition and because the top of the formation is eroded; maximum preserved thickness is estimated to be less than 500 m.

mss METASANDSTONE AND SCHIST—Interlayed metasandstone and pelitic schist in approximately equal portions. Individual layers range from 2-3 cm or less to 1 m thick. Metasandstone is medium grained, poorly to moderately foliated, and light to medium light gray; contains quartz, plagioclase (An_{15-25}), and green biotite, with minor muscovite, garnet (subhedral to anhedral, poikiloblastic), microcline, and opaque minerals. Pelitic schist is medium to coarse grained, strongly foliated, and light to medium gray to light silvery gray; composed of muscovite, green biotite (partially retrograded to chlorite), quartz, plagioclase (An_{20-25}), kyanite (subhedral, cleaved), and garnet (subhedral to anhedral, poikiloblastic), with minor staurolite (anhedral, poikiloblastic; abundant in some layers), and opaque minerals. This unit resembles the Tallulah Falls Formation to the southeast and southwest, and also the Great Smoky Group northwest of the Prentiss quadrangle. The metasandstones are sufficiently resistant to form exfoliation surfaces at some places, even at low elevations. Metasandstones yield reddish-orange sandy soils on gentle slopes at low elevations; pelitic schists form orange-red clayey soils under similar conditions. Thickness, estimated from present outcrop width and average dip, is about 2,500 m.

tf<ssg TALLULAH FALLS FORMATION—Predominantly biotite paragneiss and schist occurring in medium to thick layers. Biotite paragneiss is coarse grained and medium to medium dark gray; contains quartz (polygonal with later strain), plagioclase (An_{20-30}), biotite, muscovite, and garnet, with minor amounts of zircon, epidote, and opaque minerals. Biotite schist is coarse grained and medium to dark gray; contains biotite, orthoclase, quartz, garnet (skeletal, almost vermicular), and sillimanite, with minor opaque minerals. Within the formation are interlayers of pelitic schist, metasandstone to metagraywacke, and minor calc-silicate quartzite. Much of the pelitic schist is coarse grained and light to medium gray; composed of quartz (polygonal with later strain), muscovite, green and brown biotite (partially replaced by chlorite), plagioclase (An_{20-25}, some myrmekitic), kyanite (subhedral, fractured) or sillimanite (fibrous to prismatic), and garnet (subhedral to anhedral, some poikiloblastic, some with poikiloblastic cores and clear, unsieved rims), with minor opaque minerals. Some of the pelitic schist is light to medium gray and highly retrograded; contains sericite, muscovite, chlorite, quartz, and minor garnet (partially deformed and retrograded in some specimens); microscopic brecciation seen locally. Metasandstone to metagraywacke interlayers are composed of quartz, plagioclase (An_{20-25}), biotite, and locally garnet and muscovite.

Sillimanite schist and gneiss unit (ssg) is a facies within the Tallulah Falls Formation in which sillimanite-bearing pelitic schist and gneiss are very abundant. This unit is less than 400 m thick.

Soils from the Tallulah Falls Formation are dark reddish brown to reddish orange. The minimum thickness of the formation in this area is about 1 000 m.

- Contact, dashed where approximately located, short-dashed where concealed
- Vertical contact of dike
- Thrust fault, dashed where approximately located, short-dashed where concealed. Sawteeth on upper plate
- K Klippe
- W Window

Planar Features

- Strike and dip of compositional layering or bedding
- Strike and dip of schistosity
- Strike of vertical schistosity
- Strike and dip of foliation
- Strike of vertical foliation

Linear Features

- Bearing and plunge of mineral lineation
- Bearing and plunge of axis of mesoscopic flowage fold; numeral, where present, designates fold generation
- Bearing and plunge of crenulation axis; numeral, where present, designates fold generation
- Bearing and plunge of axis of mesoscopic open fold

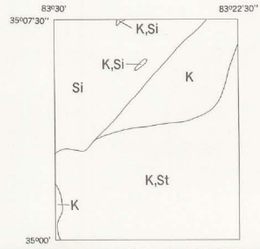

Figure 1—Distribution of metamorphic index minerals in the Prentiss quadrangle
K-Kyanite, Si-Sillimanite, St-Staurolite

MINERAL RESOURCES

- Area of numerous mines or prospects (inactive)
- Inactive mine or quarry
- Inactive open pit
- X Prospect
- 3 Map numbers refer to descriptions in Mineral Resources Summary
- an Anthophyllite
- bs Building stone
- Cr Chromite
- cs Crushed stone
- Cu Copper
- Fe Iron
- mi Mica
- s Sand
- sa Saprolite
- so Soapstone
- ta Talc
- v Vermiculite

Table 1—Mines, quarries, pits, and prospects in the Prentiss quadrangle

[All localities are inactive or abandoned.]

Map Number	Name	Mineral Commodity
1	Commissioner Creek (Norton) prospects	Chromite, vermiculite, talc, anthophyllite, soapstone
2	Cunningham mine	Talc, anthophyllite, soapstone
3	Peterman mine	Anthophyllite
4	Mine (name unknown)	Mica
5	Childress prospect	Mica
6	Carpenter mine	Mica
7	Mine (name unknown)	Mica
8	Mine (name unknown)	Mica
9	Stamey mine	Mica
10	Hodgins mine	Mica
11	Hodgins prospect	Mica
12	Hodgins prospect	Mica
13	Mine (name unknown)	Mica
14	Carpenter prospect	Mica
15	Charles Ledford prospect	Mica
16	Wilkins Lick (Verdell) mine	Mica
17	Mine (name unknown)	Mica
18	Mine (name unknown)	Mica
19	Randall prospect	Mica
20	Dills prospect	Mica
21	Dills mine	Mica
22	Prospect (name unknown)	Copper
23	Prospect (name unknown)	Iron, copper
24	Unnamed pit	Saprolite
25	Unnamed quarry	Crushed stone
26	Unnamed pit	Sand
27	Unnamed pit	Building stone
28	Unnamed pit	Building stone
29	Unnamed pit	Sand

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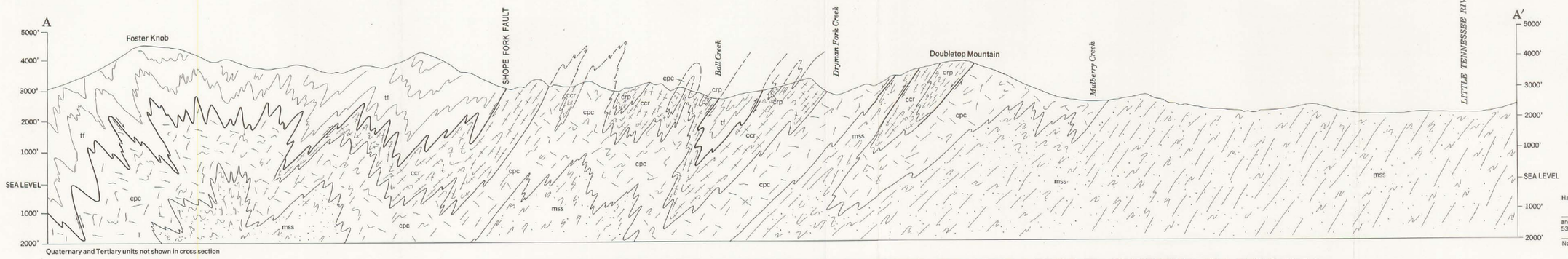

Quaternary and Tertiary units not shown in cross section

GEOLOGIC MAP OF THE PRENTISS QUADRANGLE, NORTH CAROLINA

By

Robert D. Hatcher, Jr.

1980