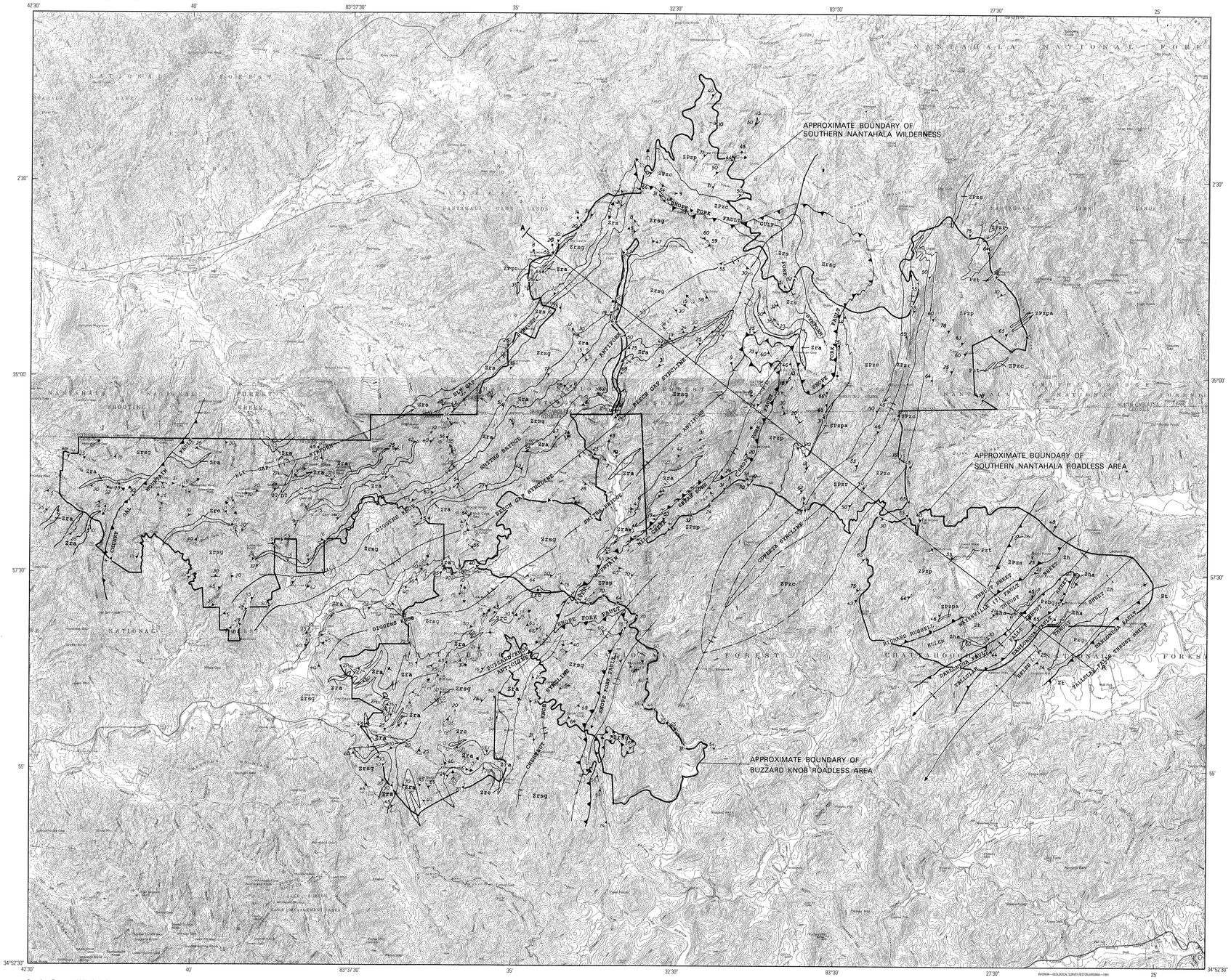


Base from Tennessee Valley Authority and U.S. Geological Survey 1:24,000
Prentiss, 1946 (photorevised 1978); Dillard, 1946 (photorevised 1967); Hightower Bald, 1946; Rainbow Springs, 1957 (photorevised 1978); and Macedonia, 1966

SCALE 1:48 000

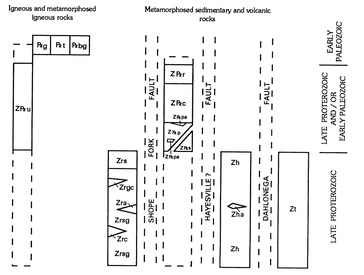
1 0 1 2 3 MILES

1 0 1 2 3 4 5 KILOMETERS

CONTOUR INTERVAL 40 FEET AND 20 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

Geology mapped by J.D. Peper 1985-87; L.J. Cox 1985-86; F.G. Lesure 1985-1987; J.P. D' Agostino 1985-86; assisted by D. Kay and J.A. Goss, 1985; M.K. Brown and R. Lopez, 1985-86; J.C. Jackson and E.D. Cron, 1986; C.A. Edwards and Z.A. Zwiebell, 1987

CORRELATION OF MAP UNITS



DESCRIPTION OF MAP UNITS

Where hyphenated mineral names are used as modifiers in the rock names below, the rock names list the constituent minerals in decreasing order of abundance, beginning with the most abundant mineral. Minerals that are not present in every sample of the rock unit but are present in many samples are enclosed in parentheses. Rock-name modifiers with "ic" endings denote distinctive rock texture, or characteristic or distinctive minerals present in the rock in amounts generally less than 5 percent.

Pzg — **Granite (Late Paleozoic?)**—Light-yellowish-gray, medium-coarse-grained to pegmatitic, porphyritic, weakly foliated; two-mica granite intrudes the southeast corner of the study area at Smokehouse Knob. Perthitic feldspar phenocrysts are generally 2 cm long but range from 0.5 to 15 cm in length

Pzt — **Trondhjemite (Middle to Early Paleozoic)**—Light-gray to white, fine- to medium-grained dikes or sills having a maximum thickness of 1 m (outcrop exaggerated on map). Trondhjemite contains 2 mm phenocrysts of zoned plagioclase in a groundmass of sodic oligoclase and quartz with accessory biotite, muscovite, epidote, zircon, and opaque minerals (Hatcher, 1980)

Pzbg — **Biotite granite gneiss (Paleozoic)**—Moderately to strongly foliated, medium- to coarse-grained feldspar-quartz-biotite-(muscovite)-gneiss. The rock appears striped where closely spaced but discontinuous lenses of segregated biotite (3 cm long) occur within rust-stained, quartz-feldspar groundmass. Informal Rabun gneiss of Hatcher (1974)

ZPzu — **Altered ultramafic rock in pods and lenses (Early Paleozoic to Late Proterozoic)**—Includes compositionally massive, light-gray to dark-greenish-gray,massive, strongly foliated, talc-chlorite-tremolite schist, talc schist, dark-green soapstone, actinolite schist, and actinolite-plagioclase gneiss. Includes rare relict pods of pyroxenite

RICHARD RUSSELL THRUST SHEET

ZPzr — **Ridgepole Mountain Formation of Hatcher (1979) (Early Paleozoic to Late Proterozoic)**—Predominately greenish-gray micaceous quartzite and coarse-grained muscovite-biotite-(kyanite)-garnet-staurolite-plagioclase-quartz schist with coarser garnet and quartz-rich layers. Knots of reddish-brown garnets are generally 1–2 cm across. Unit contains localized beds of medium-grained quartz-biotite schist and mica quartzite. Mica schist beds range from 3 cm to 3 m thick. Thick (25 cm to 1.5 m) white and tan beds of metaorthoquartzite (Hatcher, 1980) are commonly interlayered with the micaceous quartzite. All quartzites contain lesser but variable proportions of muscovite, biotite, skeletal garnet, epidote-clinozoisite, poikiloblastic staurolite, and opaque minerals (Hatcher, 1980). Retrogressive chlorite after biotite and garnet (Hatcher, 1980) in micaceous rocks imparts greenish hue

ZPzc — **Coleman River Formation of Hatcher (1979) (Early Paleozoic to Late Proterozoic**—Light- to medium-gray, fine- to medium-grained, pinstriped, garnet- and locally magnetite-bearing mica schist that varies locally to feldspathic mica gneiss. Commonly interlayered with coarser biotite schist and gneiss or quartz-mica schist with red garnet or staurolite megacrysts. Local pegmatitic muscovite-quartz-feldspar lenses occur roughly parallel to the foliation. Where banded and weakly foliated, unit resembles metasandstone

Local beds of calc-silicate quartzite composed of quartz, plagioclase, epidote, clinozoisite, garnet, and hornblende occur in massive, poorly foliated layers up to 25 cm thick (Hatcher, 1980). There are also local beds of amphibolite and hornblende gneiss

ZPzp — **Persimmon Creek Gneiss of Hatcher (1979) (Early Paleozoic to Late Proterozoic)**—The lower two-thirds of the formation is dominated by massive, coarse-grained, poorly foliated, epidote-bearing feldspar-biotite-quartz gneiss. Hatcher (1980) describes this unit as gneiss of near quartz diorite composition; composed of plagioclase (An_{15-25}), quartz, and green biotite with lesser amounts of muscovite, clinozoisite-epidote, chlorite after biotite, garnet, and opaque minerals. In places this unit is banded black and white with interlayers of quartz-mica schist, coarse-grained biotite-garnet schist, or massive, weakly foliated, biotite-quartz-feldspar gneiss with garnet metacrysts. Accessory magnetite and pyrite occur locally. There are also local beds of amphibolite and hornblende gneiss.

The upper third of the formation contains medium- to dark-gray, medium- to coarse-grained, moderately foliated, quartz-biotite-muscovite-(kyanite) schist with minor pink garnet and greenish-gray, medium- to coarse-grained feldspathic mica schist and gneiss with epidote and minor poikilitic megacrysts of garnet. A much-deformed kyanite-bearing biotite-garnet-staurolite gneiss occurs locally as interlayers in the feldspathic gneiss. Hatcher (1980) describes the beds interlayered with massive gneiss in this part of the formation as 1-cm- to 1-m-thick metasandstone and quartz-feldspar gneiss and thinner pelitic schist ranging from a few millimeters to 25 cm thick

ZPzpa — **Amphibolite and hornblende gneiss (Early Paleozoic to Late Proterozoic** —Greenish-gray to greenish-black amphibolite and hornblende gneiss interlayered with other rock units; only the larger bodies are mapped. Amphibolite contains hornblende, plagioclase (An_{30-40}), epidote, clinozoisite, and quartz, with minor chlorite, sphene, and opaque minerals; the gneiss contains plagioclase (An_{30-50}), hornblende, biotite, and quartz, with minor sphene and opaque minerals (Hatcher, 1980)

ZPzs — **Garnetiferous mica schist (Early Paleozoic to Late Proterozoic?)**—Silvery-gray, coarse-grained muscovite-garnet schist interbedded with highly contorted, pinstriped, feldspathic mica schist. Lenses of 2- to 4-mm-wide garnets parallel bands of milky to clear quartz in the deformed rocks

HELEN THRUST SHEET

Zrs — Feldspar-quartz-muscovite-biotite-(sillimanite)-garnet schist—Chiefly reddish-orange to dark-gray weathering, thinly to thickly parted, feldspathic schist interlayered with less abundant silvery-gray muscovite-sillimanite-garnet schist and with fine-grained, rusty-yellow-orange weathering, sulfidic, feldspar-quartz-sillimanite-biotite-garnet schist with prismatic sillimanite

Zra — Amphibolite—Includes a variety of strongly foliated, thinly layered to massive hornblende-rich rocks that include hornblende-andesine-(garnet)-(quartz) amphibolite, some with minor relict orthopyroxene and clinopyroxene, and trace epidote, sphene, and chlorite. Lesser metagabbro, thin-layered plagioclase-quartz-hornblende-(biotite) gneiss, and rare coarse-grained hornblende-plagioclase-garnet meta-agglomerate or meta-breccia occur with the amphibolite. Most amphibolite is interlayered with gneiss, schist and calc-silicate rocks

Zrc — Calc-silicate gneiss—Includes a variety of light-brown to light-olive-gray weathering, thinly layered quartz-epidote-carbonate-garnet gneiss, epidote-quartz-hornblende gneiss, quartz-epidote-magnetite rock, and hornblende-plagioclase rock interlayered with quartz-feldspar-epidote gneiss. Trace constituents include biotite, sphene, chlorite, and rare sulfide. Calc-silicate gneisses are interlayered with layers of plagioclase-quartz-biotite gneiss and minor schist

Zrgc — Calc-silicate gneiss interlayered with muscovite schist—Thinly layered, light- to medium-gray plagioclase-quartz-epidote gneiss and plagioclase-quartz-hornblende epidote gneiss interlayered on a scale of 1–6 cm with medium-gray feldspar-quartz-muscovite-biotite-garnet schist

TALLULAH FALLS THRUST SHEET

Zh — **Gray schist of the Helen Belt (Early Paleozoic to Late Proterozoic)**—Gray, strongly foliated, medium-grained quartz-feldspar-biotite schist; appears both as a massive pinstriped unit and as 12-m-thick sequences comprised of 2–6 cm interlayers distinguished by the proportion of biotite to quartz, the biotite-rich layers having the pinstriped texture. The repetition of this interlayered rock in much larger, banded sequences is broken by 6-cm-thick beds of coarse-grained, poorly to moderately foliated quartz-feldspar-(biotite)-(muscovite)-schist; 3-cm-thick beds of calc-silicate-bearing mica schist; and local, variably thick layers of amphibolite and hornblende gneiss. Beds of light-gray, coarse-grained, muscovite-biotite-(garnet)-staurolite schist are also found interbedded with the more quartzose schists

Zha — **Amphibolite and hornblende gneiss**—Greenish-gray to black amphibolite and hornblende gneiss occur interlayered with the gray schists of the Helen group.

Zt — **Tallulah Falls Formation (Late Proterozoic)**—Predominately medium- dark-gray, coarse-grained, medium- to thick-layered biotite paragneiss and schist with interlayers of mica schist, metasandstone to metagraywacke, and minor calc-silicate quartzite. Biotite paragneiss contains quartz, plagioclase (An_{20-30}), biotite, muscovite, and garnet, with minor amounts of zircon, epidote, and opaque minerals (Hatcher, 1980). The coarse-grained, medium- to dark-gray biotite schist is composed of biotite, orthoclase, quartz, garnet, and sillimanite, with accessory opaque minerals (Hatcher, 1980). Lighter-gray mica schist contains quartz, muscovite, green and brown biotite, retrogressive chlorite, plagioclase (An_{20-25}), kyanite or sillimanite, garnet, and accessory opaque minerals (Hatcher, 1980)..The metasandstone to metagraywacke contains quartz, plagioclase (An_{20-25}), biotite, and (locally) garnet and muscovite (Hatcher, 1980)

Zrsg — Schist and gneiss—Chiefly oligoclase-quartz-biotite (potassium-feldspar)-(muscovite)-(garnet) gneiss interlayered with much less abundant amphibolite, sulfidic sillimanite schist, gray muscovite-biotite schist, and quartz-rich granular biotite-gneiss (metasandstone) in thin layers. Most gneiss is light- to medium-gray, medium- to fine-grained, (salt-and-pepper textured) oligoclase-quartz-biotite gneiss, layered on a scale of 1–10 cm and parted on a scale of 6 cm to 0.5 m. Biotite content is less than 15 percent, typically 5–7 percent. Gneiss typically contains trace chlorite, opaque oxide. Schistose varieties of gneiss contain potassium feldspar and muscovite and are typically medium- to coarse-grained, medium-gray rocks that are strongly foliated and mostly regularly parted on a scale of 0.3–0.6 m. Some schistose layers contain up to 15 percent pale-red garnet. Gneiss in shear zone is light-gray, irregularly parted, feldspar-quartz-biotite-garnet flaser gneiss with 1- to 3-cm ovoid feldspar-quartz flasers and longer plates separated by streaked-out biotite clusters.

EXPLANATION OF MAP SYMBOLS

Contact, approximately located—Dashed where position outside study area boundary is inferred from generalized smaller-scale geologic maps (Hatcher, 1979)

Thrust fault, approximately located—Sawteeth on upper plate; queried where probable; dashed where position outside study area boundary is inferred from smaller-scale geologic maps (Hatcher, 1979; Nelson and others, 1987)

Steeply dipping fault, approximately located—U?, probable upthrown block; D?, probable downthrown block

Shear zone—Shows distribution of broken rock and map sense of shearing along spaced cleavage

Strike and Dip of Compositional Layering and (or) Foliation

Inclined

Vertical

Horizontal

Steeply dipping quartz vein—Long axis of symbol shows trend

BEARING AND PLUNGE OF LINEATION

May be combined with inclined compositional layering and (or) foliation symbol to record data observed at same locality; symbols intersect at point of observation

Minor F_1 or F_2 fold, see text—Fold has schistosity as axial plane

Minor F_3 fold, see text—Fold has spaced cleavage as axial plane

Elongate mineral lineation

MESOSCALE FOLDS

(Showing axial trace and direction of plunge)

Anticline

Syncline

Doubly plunging anticline

MAP-SCALE FOLDS

(Showing axial trace and direction of plunge)

Overturned anticline or antiform

Overturned syncline or synform

Syncline

Anticline

Doubly overturned anticline or antiform

Doubly overturned syncline or synform

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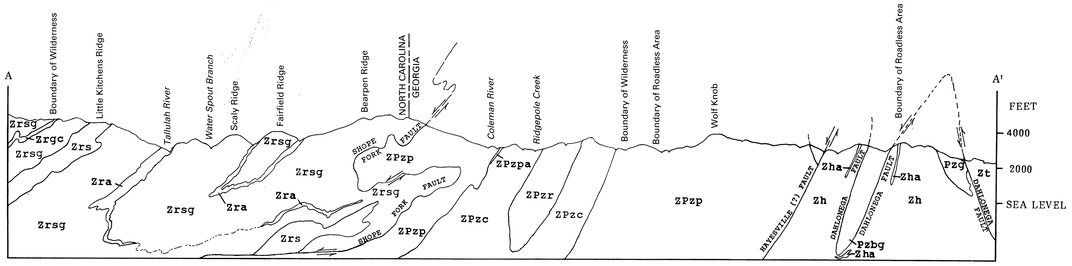
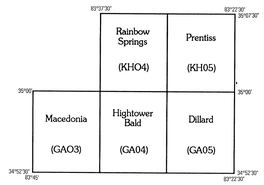
AREA OF THIS REPORT





Index map showing U.S. Geological Survey 7.5 minute quadrangle coverage for this report. Symbols in parentheses are prefixes of sample numbers as used in the accompanying text, Adrian, D'Agostino, and others (1989), Adrian, Peper, and others (1989), Cox and others (1987), and Hopkins and others (1989).

GEOLOGIC MAP OF THE SOUTHERN NANTAHALA WILDERNESS AND ADJACENT ROADLESS AREAS, GEORGIA AND NORTH CAROLINA