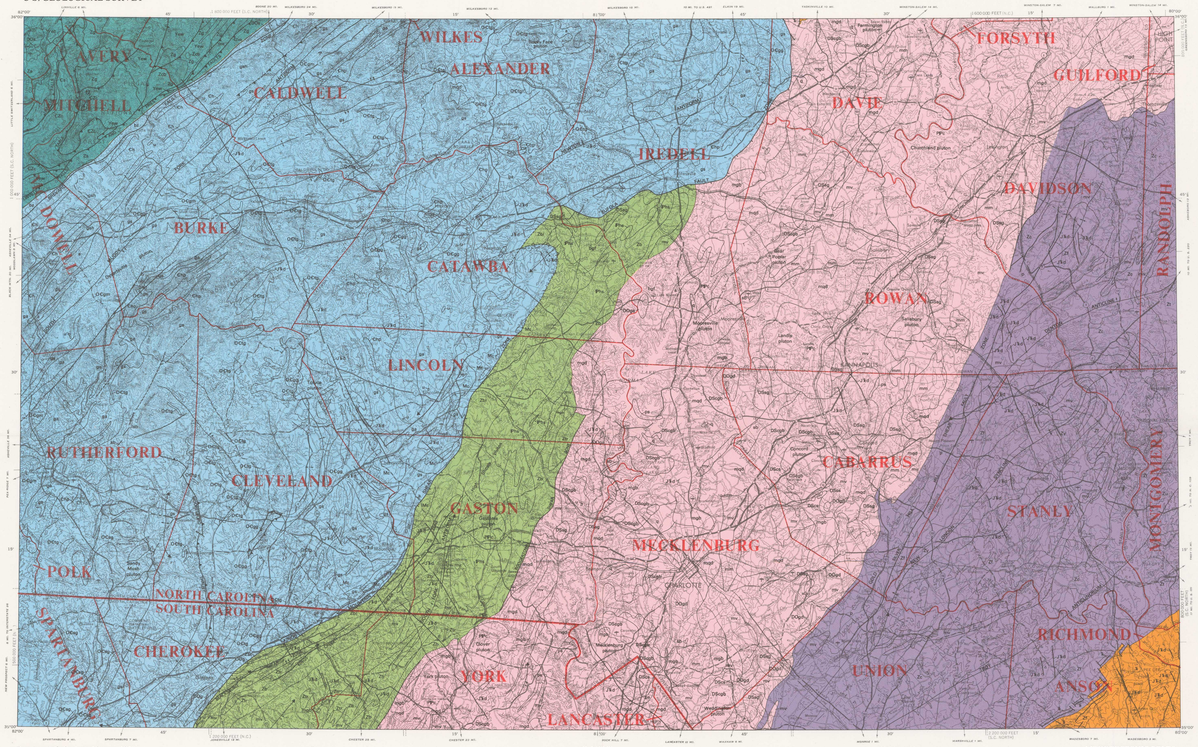
DEPARTMENT OF THE INTERIOR
U. S. GEOLOGICAL SURVEY

MISCELLANEOUS INVESTIGATIONS SERIES
MAP I-1251-F (SHEET 1 OF 3)



Base from U.S. Geological Survey, 1953

Photorevision as of 1974

100,000-foot grids based on North Carolina coordinate system and South Carolina coordinate system, north zone

Geologic base generalized from Geologic map of the Charlotte 1° X 2° quadrangle, North Carolina and South Carolina, by Richard Goldsmith, Daniel J. Milton, and J. Wright Horton, Jr., Miscellaneous Investigations Series Map I-1251-E, in press

APPROXIMATE MEAN DECLINATION, 1968

SCALE 1:375 000

CONTOUR INTERVAL 100 FEET WITH SUPPLEMENTARY CONTOURS AT 50 FEET INTERVALS

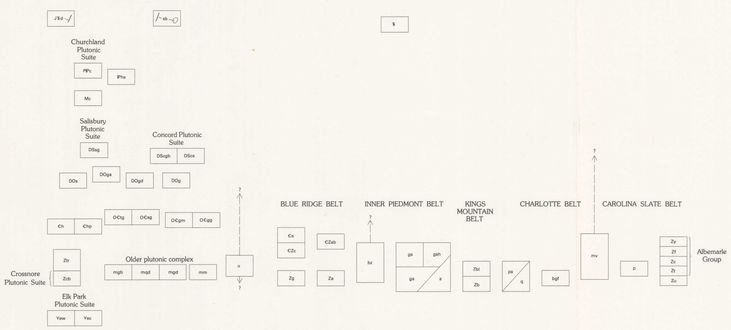
TRANSVERSE MERCATOR PROJECTION

LOCATION DIAGRAM

LITHOTECTONIC BELTS

- Triassic-age rocks
- Carolina slate belt
- Charlotte belt
- Kings Mountain belt
- Inner Piedmont belt
- Blue Ridge belt

CORRELATION OF MAP UNITS



DESCRIPTION OF MAP UNITS

This map is generalized from U.S. Geological Miscellaneous Investigative Map I–1251-E in order to make an appropriate base for mineral-resource assessment as part of a project in the Conterminous United States Mineral Assessment Program. Most of the plutonic rock units and all localities of ultramafic rock are shown. Minor stratiform rock units and subdivisions of major stratiform rock units have not been shown.

Sedimentary and volcanic rocks and their metamorphic equivalents

- s — Sandstone, siltstone, and conglomerate
- Cx — Shady Dolomite (Early Cambrian)
- Czs — Chilhowee Group (Early Cambrian to Late Proterozoic)—Quartzite, arkosic quartzite, and phyllite
- €Zab — Alligator Back Formation (Early Paleozoic and/or Late Proterozoic)—Laminated quartzofeldspathic gneiss, mica schist, and amphibolite
- br — Rocks of the Brevard zone—Variably sheared biotite gneiss, mica schist, quartzite, metavolcanic rocks, phyllite, and marble. Includes rocks of several formations
- gsh — Muscovite schist, layered biotite gneiss, and subordinate quartzite and amphibolite; contains narrow zones of Henderson Gneiss
- gs — Biotite gneiss, biotite-muscovite schist, sillimanite mica schist, and subordinate layers of calc-silicate rock, quartzite, metaconglomerate, and many small masses of granite and pegmatite
- bgf — Fine-grained biotite gneiss—Strongly foliated but commonly massive rock of granitic to tonalitic composition. Minor amphibolite and muscovite schist. Probably metamorphosed intermediate volcanic rock
- gs — Biotite gneiss, amphibolite and hornblende gneiss; minor sillimanite and mica schist, and many small masses of granite and gneiss locally forming migmatite
- a — Amphibolite
- ps — Phyllite and mica schist; minor quartzite
- q — Quartzite; subordinate mica schist and phyllite. Probably includes both metamorphosed sandstones and metamorphosed hydrothermally leached and silicified rock
- mv — Metavolcanic rocks, undivided—Includes mafic, intermediate, and felsic volcanic rocks and Flat Swamp Member of the Cid Formation and metavolcanic rocks of the Battleground Formation
- Zg — Grandfather Mountain Formation (Late Proterozoic)—Arkose, siltstone, phyllite, conglomerate, and felsic volcanic rocks
- Za — Ashe Formation (Late Proterozoic)—Muscovite-biotite gneiss, commonly sulfidic; mica schist, and amphibolite
- Zy — Yadkin Formation (Late Proterozoic)—Graywacke
- Zf — Floyd Church Formation (Late Proterozoic)—Siltstone and argillite
- Zc — Cid Formation (Late Proterozoic)—Mudstone member
- Zt — Tillery Formation (Late Proterozoic)—Laminated siltstone and mudstone
- Zu — Uwharrie Formation (Late Proterozoic)—Felsic volcanic rocks
- p — Phyllite (Late Proterozoic)—Probably equivalent to Tillery Formation (Zt) and Cid Formation (Zc)
- Zbl — Blacksburg Formation (Late Proterozoic)—Sericite phyllite or schist and subordinate beds of marble, micaceous quartzite, and amphibolite
- Zb — Battleground Formation (Late Proterozoic)—Quartz-sericite schist and phyllite, and subordinate beds of quartz-pebble conglomerate, quartzite, kyanite or sillimanite quartzite, and manganiferous schist. Metavolcanic rocks of the Battleground Formation are included in mv

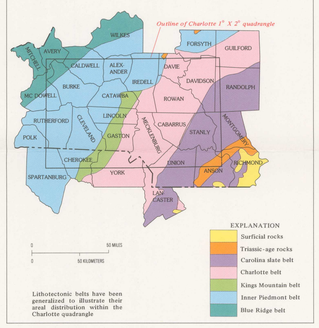
Intrusive and altered rocks

- €Yd — Diabase (Jurassic and Triassic?)
- €b — Silicified breccia zones
- €Pc — Churchland Plutonic Suite (Permian and Pennsylvanian)—Predominantly porphyritic granite containing microcline phenocrysts
- €Pm — High Shoals Granite (Pennsylvanian)—Porphyritic gneissic granite
- Mc — Cherryville Granite (Mississippian)—Biotite-muscovite granite; some associated pegmatites contain spodumene
- DSsg — Salisbury Plutonic Suite (Devonian and Silurian)—Leucocratic granite
- DSsgh — Concord Plutonic Suite (Devonian and Silurian)—Gabbro, norite, gabbro-norite, and hornblende gabbro
- DSss — Syenite of Concord Plutonic Suite
- DOgs — Alaskitic granite, fine-grained
- DOgd — Granodiorite, non- to weakly foliated
- DOg — Gneissic metagranite—Medium- to coarse-grained gneissic biotite granite
- DOs — Spruce Pine Alaskite (Early Devonian to Late Ordovician)—Biotite-muscovite granite and granodiorite; associated pegmatites are a source for feldspar and muscovite
- OCtg — Toluca Granite (Early Ordovician and Cambrian)—Medium-grained gneissic to non-gneissic granite and granodiorite; garnet and monazite common accessories
- OCwg — Granite of Sandy Mush—Porphyritic gneissic granite probably genetically related to the Toluca Granite
- OCgm — Migmatitic granitoid gneiss and quartz-diorite gneiss containing inclusions and screens of biotite gneiss, amphibolite and metagabbro, and masses of gneissic and non-gneissic granite to quartz diorite similar to the Toluca Granite
- OCgd — Granitoid gneiss—Layered gneissic biotite granite to hornblende-biotite quartz diorite
- €h — Henderson Gneiss (Cambrian)—Inequigranular, granitic to granodioritic biotite gneiss. Typically contains lensoid microcline mega crysts and microcline-plagioclase aggregates parallel to foliation
- €hp — Garnetiferous phase of Henderson Gneiss—Granitic to granodioritic biotite gneiss containing tabular to lensoid feldspar megacrysts in garnetiferous matrix
- Zm — Metamorphosed trondhjemite and biotite tonalite (Late Proterozoic)
- mgb — Metamorphosed gabbro, diorite, and diabase
- mgd — Metamorphosed quartz diorite, diorite, and tonalite; locally porphyritic
- mgd — Metamorphosed granodiorite; locally porphyritic
- mm — Mafic and ultramafic complex—Metamorphosed gabbroic and ultramafic intrusives, hypabyssal and probably extrusive basalts
- u — Ultramafic rocks, variably altered to soapstone and serpentinite
- Zcb — Brown Mountain Granite (Late Proterozoic)—Medium- to coarse-grained leucocratic granite, locally blastomylonitic
- Ywe — Wilson Creek Gneiss and Blowing Rock Gneiss (Middle Proterozoic)—Equigranular granite to diorite gneiss; coarse-grained granite augen gneiss
- Yec — Cranberry Gneiss (Middle Proterozoic)—Equigranular granite and layered granite, granodiorite, and biotite gneiss

EXPLANATION OF MAP SYMBOLS

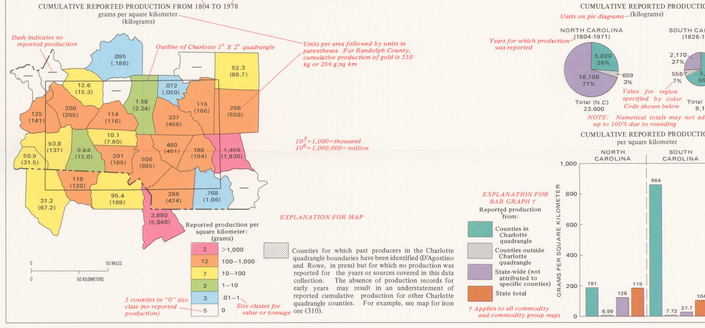
- Contact
- High-angle fault, dashed where inferred
- Reverse fault, teeth on upthrown plate, dashed where inferred
- Reverse fault, overturned
- Thrust fault, teeth on overriding plate, dashed where inferred
- Anticline or antiform, showing direction of plunge
- Syncline or synform, showing direction of plunge
- Overturned anticline, or antiform showing direction of dip of limbs
- Overturned syncline or synform, showing direction of dip of limbs

LITHOTECTONIC BELTS AND BOUNDARIES OF COUNTIES THAT ARE TOTALLY OR PARTIALLY WITHIN THE CHARLOTTE QUADRANGLE

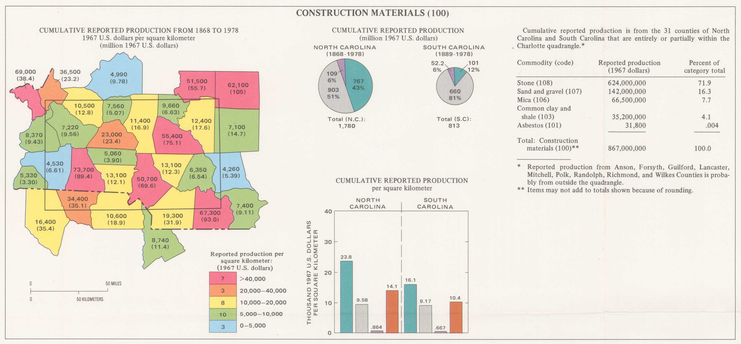


Lithotectonic belts have been generalized to illustrate their areal distribution within the Charlotte quadrangle

HOW TO READ THE COMMODITY MAPS



CONSTRUCTION MATERIALS (100)

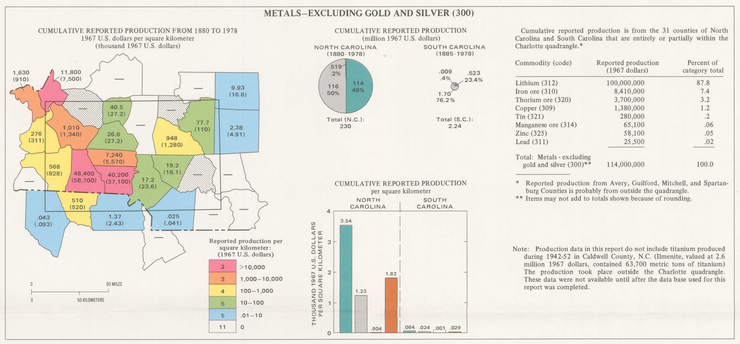


Cumulative reported production is from the 31 counties of North Carolina and South Carolina that are entirely or partially within the Charlotte quadrangle.*

Commodity (code)	Reported production (1967 dollars)	Percent of category total
Stone (108)	624,000,000	71.9
Sand and gravel (107)	142,000,000	16.3
Mica (106)	66,500,000	7.7
Common clay and shale (103)	35,200,000	4.1
Asbestos (101)	31,800	.004
Total: Construction materials (100)**	867,000,000	100.0

* Reported production from Anson, Forsyth, Guilford, Lancaster, Mitchell, Polk, Randolph, Richmond, and Wilkes Counties is probably from outside the quadrangle.
** Items may not add to totals shown because of rounding.

METALS–EXCLUDING GOLD AND SILVER (300)



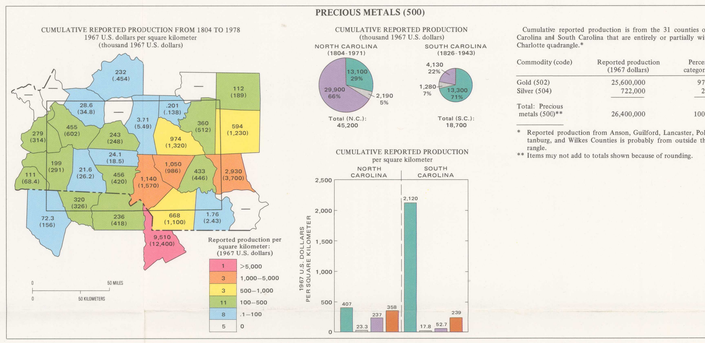
Cumulative reported production is from the 31 counties of North Carolina and South Carolina that are entirely or partially within the Charlotte quadrangle.*

Commodity (code)	Reported production (1967 dollars)	Percent of category total
Lithium (312)	100,000,000	87.8
Iron ore (310)	8,410,000	7.4
Thorium ore (320)	3,700,000	3.2
Copper (309)	1,380,000	1.2
Tin (321)	280,000	.2
Manganese ore (314)	65,100	.06
Zinc (325)	58,100	.05
Lead (311)	25,500	.02
Total: Metals - excluding gold and silver (300)**	114,000,000	100.0

* Reported production from Avery, Guilford, Mitchell, and Spartanburg Counties is probably from outside the quadrangle.
** Items may not add to totals shown because of rounding.

Note: Production data in this report do not include titanium produced during 1942-52 in Caldwell County, N.C. (Ilmenite, valued at 2.6 million 1967 dollars, contained 63,700 metric tons of titanium) The production took place outside the Charlotte quadrangle. These data were not available until after the data base used for this report was completed.

PRECIOUS METALS (500)

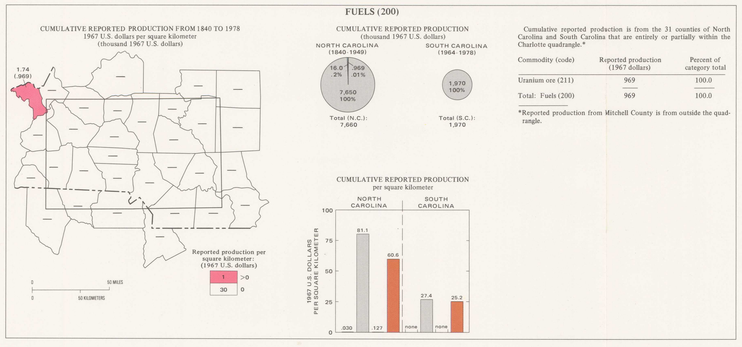


Cumulative reported production is from the 31 counties of North Carolina and South Carolina that are entirely or partially within the Charlotte quadrangle.*

Commodity (code)	Reported production (1967 dollars)	Percent of category total
Gold (502)	25,600,000	97.3
Silver (504)	722,000	2.7
Total: Precious metals (500)**	26,400,000	100.0

* Reported production from Anson, Guilford, Lancaster, Polk, Spartanburg, and Wilkes Counties is probably from outside the quadrangle.
** Items may not add to totals shown because of rounding.

FUELS (200)

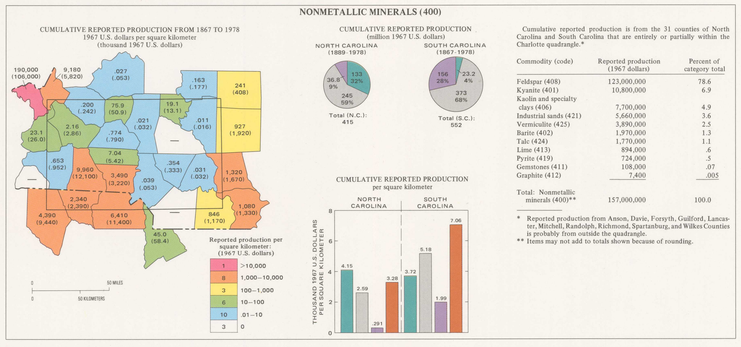


Cumulative reported production is from the 31 counties of North Carolina and South Carolina that are entirely or partially within the Charlotte quadrangle.*

Commodity (code)	Reported production (1967 dollars)	Percent of category total
Uranium ore (211)	969	100.0
Total: Fuels (200)	969	100.0

*Reported production from Mitchell County is from outside the quadrangle.

NONMETALLIC MINERALS (400)

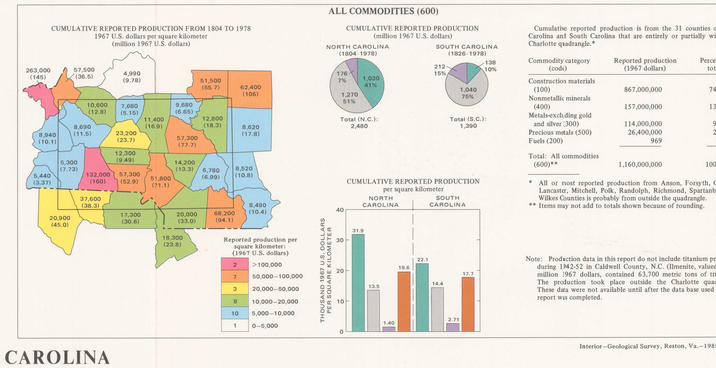


Cumulative reported production is from the 31 counties of North Carolina and South Carolina that are entirely or partially within the Charlotte quadrangle.*

Commodity (code)	Reported production (1967 dollars)	Percent of category total
Feldspar (408)	123,000,000	78.6
Kyanite (401)	10,800,000	6.9
Kaolin and specialty clays (406)	7,700,000	4.9
Industrial sands (421)	5,660,000	3.6
Vermiculite (423)	3,890,000	2.5
Barite (402)	1,970,000	1.3
Talc (424)	1,770,000	1.1
Lime (413)	894,000	.6
Pyrite (419)	724,000	.5
Gemstones (411)	108,000	.07
Graphite (412)	7,400	.005
Total: Nonmetallic minerals (400)**	157,000,000	100.0

* Reported production from Anson, Davie, Forsyth, Guilford, Lancaster, Mitchell, Randolph, Richmond, Spartanburg, and Wilkes Counties is probably from outside the quadrangle.
** Items may not add to totals shown because of rounding.

ALL COMMODITIES (600)



Cumulative reported production is from the 31 counties of North Carolina and South Carolina that are entirely or partially within the Charlotte quadrangle.*

Commodity category (code)	Reported production (1967 dollars)	Percent of total
Construction materials (100)	867,000,000	74.5
Nonmetallic minerals (400)	157,000,000	13.4
Metals-excluding gold and silver (300)	114,000,000	9.8
Precious metals (500)	26,400,000	2.3
Fuels (200)	969	.0001
Total: All commodities (600)**	1,160,000,000	100.0

* All or most reported production from Anson, Forsyth, Guilford, Lancaster, Mitchell, Polk, Randolph, Richmond, Spartanburg, and Wilkes Counties is probably from outside the quadrangle.
** Items may not add to totals shown because of rounding.

MINERAL PRODUCTION MAPS OF THE CHARLOTTE 1°X 2° QUADRANGLE, NORTH CAROLINA AND SOUTH CAROLINA

By
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1985

Interior—Geological Survey, Reston, Va.—1985—G84210

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Explanatory pamphlet accompanies map