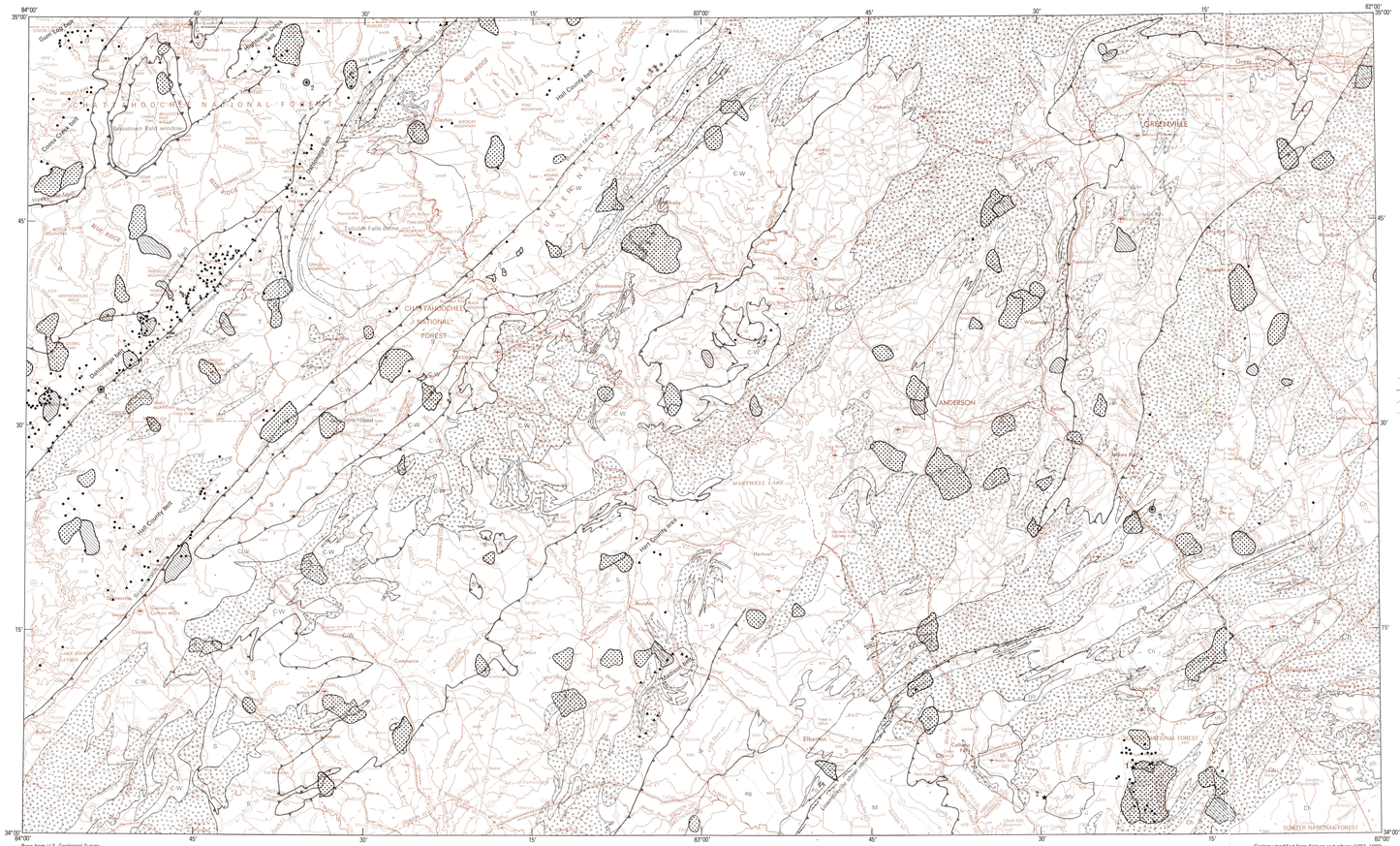
MINERAL RESOURCE ASSESSMENT OF GOLD AND SILVER IN THE GREENVILLE 1° × 2° QUADRANGLE, SOUTH CAROLINA, GEORGIA, AND NORTH CAROLINA

By
Frank G. Lesure, Gary C. Curtin, and John P. D'Agostino
1993



Base from U.S. Geological Survey, 1954 (limited revision, 1964)
Transverse Mercator projection

SCALE 1:250 000

5 0 5 10 15 20 25 MILES

5 0 5 10 15 20 25 30 35 KILOMETERS

DATUM IS MEAN SEA LEVEL

Geology modified from Nelson and others (1987, 1989)
Manuscript approved for publication March 19, 1992
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EXPLANATION
[ppm, parts per million]

- Lode gold deposit
- Placer gold deposit
- Gold in rock sample—≥0.02 ppm Au
- Gold in NURE stream-sediment sample—Showing approximate drainage basin; ≥0.1 ppm Au
- Gold in heavy-mineral concentrate—Showing approximate drainage basin; ≥20 ppm Au
- Lead–silver deposit
- Massive sulfide deposit—1, Chestatee; 2, Tom Coward; 3, Salula
- Aluminous alteration zone (quartz–andalusite–pyrophyllite rock)—1, Parson Mountain; 2, unnamed

LIST OF MAP UNITS AND SYMBOLS
[Stacking order of thrust sheets]

- **Blue Ridge thrust stack**
  - T — **Tallulah Falls thrust sheet**
  - R — **Richard Russell thrust sheet**
  - Y — **Young Harris thrust sheet**
  - H — **Helen thrust sheet**
  - G — **Great Smoky thrust sheet**
- **Inner Piedmont thrust stack**
  - L — **Laurens thrust sheet**
  - P — **Paris Mountain thrust sheet**
  - S — **Six mile thrust sheet**—Includes the metagabbro at Anderson (Paleozoic?) (eg) and the Elberton Granite (Mississippian) (mg)
- C-W — **Chauga–Wallhalla thrust complex**
- **Southeast of Lowndesville shear zone**
  - Ch — **Charlotte thrust sheet**—Includes the Concord Plutonic Suite (Silurian and Devonian) (gd) and the granitic rocks at Coronaca (as used by Fullagar and Butler, 1979; Permian) (cg)
- M — **Mafic–ultramafic thrust sheet**
- **Granite, granodiorite, quartz diorite, and diorite gneiss, undivided (Pennsylvanian to Cambrian)**—Shown mostly where rocks cover large areas or where tectonic boundaries are obscured
- **Contact**
- **Thrust fault**—Dashed where inferred, queried where uncertain. Sawteeth on upper plate
- **Shear zone**
- **Kyanite schist**—Queried where uncertain. Shown around Tallulah Falls dome

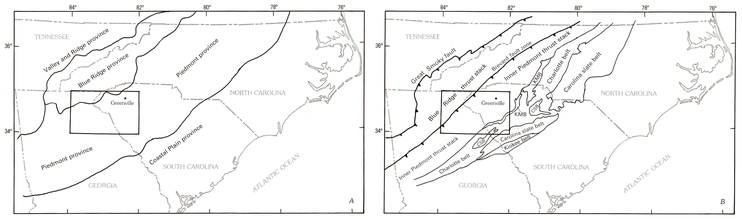
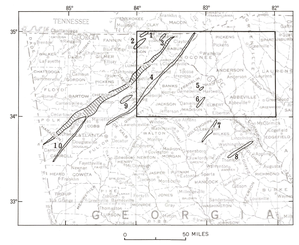


Figure 1.—Maps showing location and setting of the Greenville 1° x 2° quadrangle (box). *A*, Physiographic provinces modified from Fenneman and Johnson (1946). *B*, Pre-mesozoic interpretations of geologic terranes, modified from King (1955), Overstreet and Bell (1965a), and Nelson (1988). CSB, Carolina slate belt; KMB, Kings Mountain belt.



EXPLANATION

1. Gum Log Belt
2. Coosa Creek belt
3. Hightower Creek belt
4. Hall County belt
5. Hart County area
6. Madison County belt
7. Oglethorpe County belt
8. McDuffie County belt
9. Forsyth County area
10. Carroll County belt

Figure 4.—Map of northern Georgia and adjacent parts of Tennessee, North Carolina, and South Carolina showing counties, Greenville 1° x 2° quadrangle (box), and the Dahlonega (pattern) and other gold belts and areas modified from Jones (1909).

Table 1.—Gold and silver production in or near the Greenville 1° × 2° quadrangle by counties

[Recorded production from U.S. Bureau of the Mint (1882–83, 1884–1906). Estimated production based on totals given by Purdue and Park (1948), Vlisidy and Peyton (1961), Shirley and Smith (1961), DeYoung and others (1985), and J.H. DeYoung, Jr. (written commun., 1984). —, not available; ?, uncertain amount]

State and county[1]	Recorded production 1881–1905 (in troy ounces) Gold	Silver	Estimated production 1830–1960 (in troy ounces) Gold	Silver	Number of mines or prospects[2]	
Georgia						
Elbert	1	—	<100	—	5	(5)
Forsyth (10)	1,341*	32*	8,000*	—	16	(0)
Gwinnett (20)	192*	16*	1,000*	—	11	(0)
Habersham	798	11	4,400	—	17	(17)
Hall	1,453	196	8,600	—	37	(37)
Hart	—	—	<1000?	—	4	(4)
Lumpkin (50)	71,188	2,307	400,000	—	82	(50)
Madison	7	—	<100	—	4	(4)
Oglethorpe (10)	127*	19*	700*	—	8	(0)
Rabun	1,730	12	9,000	—	19	(19)
Towns	568	—	3,000	—	17	(17)
Union (50)	1,280	4	7,000	—	21	(15)
White	16,619	754	96,000	—	61	(61)
Total	95,304	3,351	538,200	—	302	(229)
South Carolina						
Abbeville	318	111	600	—	5	(5)
Anderson	44	11	100	—	1	(1)
Greenville (71)	87	49	200	—	7	(7)
Greenwood (80)	5	1	<100	—	2	(1)
Laurens (30)	5	—	<100	—	2	(2)
McCormick (10)	428*	123*	800*	—	8	(2)
Oconee	41	11	100	—	1	(0)
Pickens (75)	50	19	100	—	1	(1)
Spartanburg (60)	2,159*	700*	4,500*	—	6	(0)
Total	3,132.5	1,027.2	6,400	—	38	(29)
North Carolina						
Clay (5)	40	4	<100	—	1	(1)
Macon (1)	69	10	<100	—	3	(0)
Total	109	14	—	—	4	(1)
Grand total	98,547.5	4,392.2	544,600	—	344	(259)

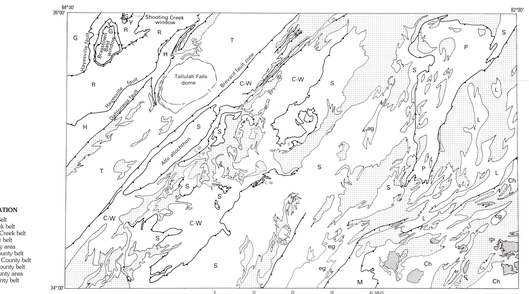
[1]Number in parentheses indicates percent of county in Greenville quadrangle (see fig. 4).
[2]From Parker and Sharp (1982), unless followed by a question mark. Number in parentheses from the Greenville quadrangle.
*Most of this production probably from outside the Greenville quadrangle.

Table 2.—Distribution of gold by rock type from the northeastern part of the Dahlonega gold belt, northeastern Georgia (modified from Lesure, 1992)

[ppm, parts per million; —, no data]

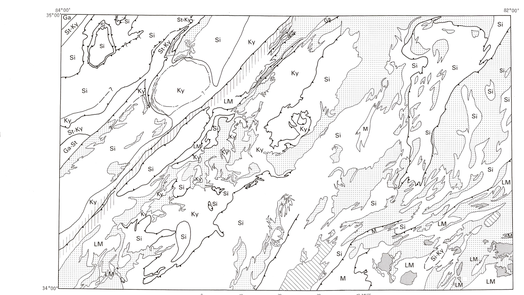
Rock type	All samples: Number samples	Percent samples	Number samples	Percent samples	Outcrop samples: Number samples	Percent samples	Mine samples: Number samples	Percent samples	Gold-bearing samples (>0 ppm): Number samples	Percent samples	Gold-bearing samples (>0 ppm): Mean	Median	Gold-bearing samples (>0.05 ppm): Number samples	Percent samples	Gold-bearing samples (>0.05 ppm): Mean	Median
All	879	359	41	529	126	24	0.5	<0.02	<0.02	0.05	0.057	350	233	67	.26	0.50
Amphibolite	63	26	41	34	8	24	.1	<0.02	<0.02	.02	.025	.29	18	62	.31	.155
Mica gneiss	89	42	47	56	17	30	.09	.013	<0.02	.042	.022	.33	25	76	.26	1.64
Interbedded gneiss–schist–amphibolite	55	16	29	41	7	17	.02	.003	<0.02	.020	—	.14	9	64	1.8	.190
Mica schist	414	169	41	292	68	23	.2	.012	<0.02	.056	.040	.152	101	66	.31	.187
Granite and diorite	17	6	35	10	1	10	.5	.05	<0.02	—	—	7	5	71	3.5	.797
Vein quartz	125	49	39	75	24	32	.1	.02	<0.02	.045	.75	54	70	130	.72	1.37
Quartzite	44	31	70	14	5	36	.06	.011	<0.02	.013	.017	30	26	87	.8	.71

[1]Samples collected more than 500 ft from a known mine area.



EXPLANATION
(Stacking order of thrust sheets)

- Blue Ridge thrust stack
  - T — Tallulah Falls thrust sheet
  - R — Richard Russell thrust sheet
  - Y — Young Harris thrust sheet
  - H — Helen thrust sheet
  - G — Great Smoky thrust sheet
- Inner Piedmont thrust stack
  - L — Laurens thrust sheet
  - P — Paris Mountain thrust sheet
  - S — Six mile thrust sheet—Includes metagabbro at Anderson (eg) and Elberton Granite (eg)
- C-W — Chauga–Wallhalla thrust complex
- Southeast of Lowndesville shear zone
  - Ch — Charlotte thrust sheet—Includes granite at Coronaca (cg)
  - M — Mafic–ultramafic thrust sheet
- Granitic rocks—Shown where they obscure faults or where extensive
- Gabbro and related rocks
- Contact
- Thrust fault—Dashed where inferred; queried where uncertain. Sawteeth on upper plate
- Kyanite schist—Queried where uncertain. Shown around Tallulah Falls dome

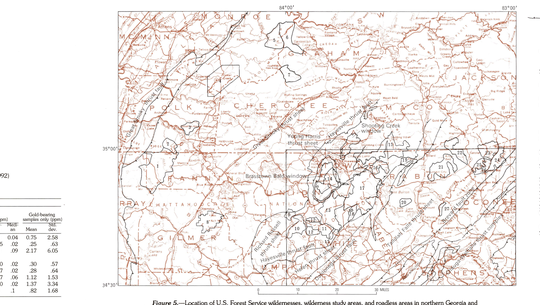


EXPLANATION

- Metamorphic grade
  - LM — Low to medium
  - M — Medium
- Metamorphic zone—May be shown combined
  - Ga — Garnet
  - St — Staurolite
  - Ky — Kyanite
  - Si — Sillimanite
- Retrograded
- Isograd—Dashed where inferred. Letters represent metamorphic zones
- Granitic rocks—Shown where they obscure faults or where extensive
- Gabbro and related rocks
- Contact
- Thrust fault—Dashed where inferred; queried where uncertain. Sawteeth on upper plate
- Kyanite schist—Queried where uncertain. Shown around Tallulah Falls dome

Figure 2.—Generalized tectonic map of the Greenville 1° x 2° quadrangle (modified from Nelson and others, 1990).

Figure 3.—Generalized tectonic map of the Greenville 1° x 2° quadrangle showing metamorphic grade and metamorphic zones (modified from Nelson, 1988). See figure 2 for explanation of geologic map units.



EXPLANATION

- Thrust Fault—Dashed where inferred. Sawteeth on upper plate

Wildernesses

1. Big Frog Block and others, 1982
2. Big Frog Mountain, 1984
3. Citico Creek (Slack and others, 1984)
4. Ellicott (Lazo, 1982)
5. Ellicott Rock (Lazo and others, 1985)
6. Joyce Kilmer–Slickrock (Lazo and others, 1977)
7. Raven Cliffs (Armstrong and Sahin, 1983)
8. Southern Nantahala (Lazo and others, 1984)
9. Southern Nantahala (Pieper and others, 1991)
10. Tray Mountain (Koeppen and others, 1988; Chatman, 1985)

Wilderness Study and Roadless Areas

18. Anna Ruby (Lesure and others, 1987a)
19. Blood Mountain (Koeppen and Nelson, 1989a)
20. Blood Mountain (Wood and Nelson, 1989)
16. Buzzard Knob (Pieper and others, 1991)
17. Chattahoochee (Koeppen and Nelson, 1989a)
26. Ellicott Rock Expansion (Lazo and others, 1985)
13. Little Frog (Fine and others, 1987)
23. Long Creek (Bell, 1987a)
24. Overflow (Koeppen and others, 1983)
25. Persimmon Mountain (Lazo and others, 1985)
12. Rabun Bald (Moore and others, 1988)
24. Rand Mountain (Bell, 1987)
22. Raven Cliff (Wood and Bell, 1986)
21. Snowbird (Lesure, 1986)
15. Southern Nantahala (Pieper and others, 1991)
10. Worley Ridge (Lesure and others, 1987b)

Other

4. Coker Creek gold district (Hale, 1974)

Figure 5.—Location of U.S. Forest Service wildernesses, wilderness study areas, and roadless areas in northern Georgia and adjacent parts of Tennessee, North Carolina, South Carolina, and references to recent geochemical studies. Northwest corner of Greenville 1° x 2° quadrangle shown by box. Tectonic map generalized from Southworth and others (1989), Georgia Geological Survey (1976), North Carolina Geological Survey (1985), Nelson and others (1989), and Nelson (1991).

INTERIOR—GEOLOGICAL SURVEY, RESTON, VA—1993
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MAP SHOWING DISTRIBUTION OF GOLD DEPOSITS AND ANOMALOUS OCCURRENCES, LEAD-SILVER DEPOSITS, AND MASSIVE SULFIDE DEPOSITS IN THE GREENVILLE 1° × 2° QUADRANGLE

DISCUSSION

INTRODUCTION

Mineral resources of the Greenville 1° x 2° quadrangle, South Carolina, Georgia, and North Carolina, were assessed between 1984 and 1990 under the Conterminous United States Mineral Assessment Program (CUSMAP) of the U.S. Geological Survey (USGS). The mineral resource assessments were made on the basis of geologic, geochemical, and geophysical investigations and on the distribution of mines, prospects, and mineral occurrences reported in the literature.

This report is an assessment of the gold and silver resources in the Greenville quadrangle and is based on analyses of rock and saprolite samples from the Dahlonega gold belt, Ga. (Lesure, in press; Lesure and others, 1991), the results of the U.S. Department of Energy, National Uranium Resource Evaluation (NURE) sampling program (Ferguson, 1978, 1979), recent work by the Georgia Geological Survey (Garman, 1985), analyses of stream-sediment and heavy-mineral-concentrate samples (G.C. Curtin, USGS, unpub. data, 1992), published mine and prospect descriptions (Becker, 1895; Yeates and others, 1896; Eckel, 1903; Lindgren, 1906; Jones, 1909; Pardee and Park, 1948; McCauley and Butler, 1966), and the geology as mapped by Nelson and others (1987, 1989).

GEOLOGIC SETTING

The Greenville 1° x 2° quadrangle extends from the Blue Ridge province in the northwest corner to the Piedmont province in the southeast corner (fig. 1*A*). In the Valley and Ridge province of the Southern Appalachians west of the Greenville quadrangle, it has long been known that westward-transported thrust sheets are the dominant structural elements (Rodgers, 1970, p. 39–59). Recent work has shown, however, that the same structural style also dominates the crystalline rocks east of the Valley and Ridge (Cook and others, 1979; Harris and others, 1981). Previously, the rocks of the Greenville quadrangle were described as parts of the Blue Ridge, Inner Piedmont, Kings Mountain, Charlotte, and the Carolina slate belt (King, 1955; Overstreet and Bell, 1965a, b; Hatcher, 1972) (fig. 1*B*).

The Greenville quadrangle contains metamorphosed crystalline rocks of mostly Late Proterozoic to Paleozoic age in 11 westward-transported thrust sheets (fig. 2), each having a characteristic rock assemblage (Nelson and others, 1989). In ascending stacking order, the Great Smoky, Helen, Young Harris, Richard Russell, and Tallulah Falls thrust sheets form the Blue Ridge thrust stack northwest of the Brevard fault zone. The Inner Piedmont thrust stack, southeast of the Brevard fault zone, contains, in ascending order, the Chauga–Wallhalla thrust complex and the Six Mile, Paris Mountain, and Laurens thrust sheets. The Lowndesville shear zone separates the Inner Piedmont thrust stack from the Charlotte thrust sheet and a separate mafic–ultramafic thrust sheet.

Rocks of all the thrust sheets are polydeformed and polymetamorphic (Nelson, 1988, p. 11). Many rocks of the Blue Ridge and Inner Piedmont thrust stacks are at medium to high metamorphic grade in the kyanite or sillimanite zone (fig. 3). The Charlotte and mafic–ultramafic thrust sheets are generally of lower grade. Nelson (1988, p. 9–11), in summarizing the timing of regional metamorphism, recognized separate metamorphic events at 470 to 430 million years ago (Ma) for the thrust sheets west of the Dahlonega thrust fault, about 365 Ma for the Tallulah Falls and Six Mile thrust sheets, about 360 or possibly 430 to 410 Ma for the Chauga–Wallhalla thrust complex, about 344 Ma for the Paris Mountain and Laurens thrust sheets, and 328 to 312 Ma for the Charlotte and mafic–ultramafic thrust sheets. Granitic masses in most of these thrust sheets appear to be generally pre- or synmetamorphic. Exceptions include the Elberton Granite in the Six Mile thrust sheet, which is 350 to 320 Ma (Ross and Bickford, 1980, p. 52; Whitney and others, 1989, p. 63), and the granite at Coronaca in the Charlotte thrust sheet, which is 278 Ma (Fullagar and Butler, 1979, p. 169).

ROCKS OF THE BLUE RIDGE THRUST STACK

Great Smoky Thrust Sheet

The Great Smoky thrust sheet in the northwest corner of the Greenville quadrangle consists chiefly of metamorphosed conglomerate, sandstone, and shale of the Great Smoky Group, which is part of the Ocoee Supergroup of Late Proterozoic age (Nelson and others, 1989). These rocks are overlain in a small area of a few acres in the farthest northwest corner of the quadrangle by the Nantahala Slate of Cambrian age. Farther southeast, rocks of the Great Smoky thrust sheet are also exposed below the Hayesville fault in the Brasstown Bald and Shooting Creek windows, which are areas eroded through the Richard Russell and Young Harris thrust sheets (fig. 2). Unlike the other thrust sheets to the southeast, the Great Smoky thrust sheet lacks recognizable igneous or metaigneous rocks in the Greenville quadrangle other than a few small mica-pegmatite bodies of metamorphic origin that are found in areas of kyanite or sillimanite metamorphic grade.

Helen Thrust Sheet

The Helen thrust sheet contains a variety of metamorphosed interlayered sedimentary and volcanic rocks of Late Proterozoic and (or) early Paleozoic age (Nelson and others, 1989). These rocks include siliceous, sandstone, shale, and chemically deposited sedimentary rocks and mafic to felsic tuffs, flows, and intrusive bodies that are now micaceous and quartzofeldspathic gneiss and schist, quartzite, iron- and manganese-rich quartz schist, amphibolite, metagabbro, granitic to dioritic gneiss, and metatrondhjemite (Cook and Burnett, 1986). Rocks of the Helen thrust sheet outlie rocks of the Great Smoky thrust sheet along an unnamed fault zone southwest of the Greenville quadrangle (Nelson, 1991). The Dahlonega fault forms the boundary between the Helen thrust sheet and the Tallulah Falls thrust sheet to the southeast.

Young Harris Thrust Sheet

A complex of mafic and ultramafic rocks makes up the relatively small Young Harris thrust sheet, which lies between the Great Smoky and the Richard Russell thrust sheets, and is exposed in narrow belts around the Brasstown Bald and Shooting Creek windows (fig. 2) in the northwestern part of the quadrangle (Nelson and others, 1989). The complex includes masses of gabbro, troctolite, pyroxenite, talc schist, eclogite, websterite, and amphibolite; it may, in part, represent a tectonic melange. The age of these rocks, which may be Late Proterozoic or early Paleozoic, is not well established. All of the other thrust sheets above the Great Smoky thrust sheet also contain a variety of rare ultramafic and mafic rocks, commonly as small discontinuous pods but locally as larger mappable units.

Richard Russell Thrust Sheet

Metasandstone, quartzofeldspathic gneiss, metagraywacke, biotite gneiss, mica schist, and lesser amounts of amphibolite, together with granitic gneiss, augen gneiss, and granitic pegmatite make up most of the Richard Russell thrust sheet (Nelson and Gillon, 1985). The metamorphic rocks are Middle Proterozoic to Paleozoic in age, but some metagabbro and quartz diorite to tonalitic gneiss in this thrust sheet may be of early Paleozoic age (Nelson, 1988; Nelson and others, 1989). This thrust sheet overlies parts of the Helen and Great Smoky thrust sheets along the Hayesville thrust fault.

Tallulah Falls Thrust Sheet

The Tallulah Falls thrust sheet consists of interlayered and folded metagraywacke, mica schist, amphibolite, aluminous schist, quartzite, biotite gneiss, biotite schist, quartzofeldspathic gneiss, amphibolite, and several types of granitoid rocks (Nelson and others, 1989). Most of the rocks are of Late Proterozoic to early Paleozoic age except for two masses of granitic gneiss of Middle Proterozoic age. This thrust sheet is bounded to the southeast by the Brevard fault zone.

ROCKS OF THE INNER PIEDMONT THRUST STACK

Chauga–Wallhalla Thrust Complex

The Chauga–Wallhalla thrust complex (of Nelson and others (1987), which contains smaller thrust sheets separated by poorly defined zones of intense shearing, bends northeastward across the quadrangle immediately southeast of the Brevard fault zone. This thrust complex includes sandstone and quartzite of the Chauga River fault, first used by Griffin (1969) in his Walhalla nappe. Abundant amphibolite, especially in the Walhalla nappe, is interspersed with various types of quartzofeldspathic and micaceous gneiss and schist, metasandstone, metasiltstone, carbonate rocks, quartzite, phyllonitic schist, and pegmatite of Late Proterozoic to early Paleozoic age in the complex.

Six Mile Thrust Sheet

Rock units consisting of various combinations of mica schist, sillimanite schist, manganiferous schist, felsic gneiss, amphibolite, quartzofeldspathic gneiss, meganoritic biotite gneiss, metagraywacke, quartzite schist, and quartzite of Late Proterozoic to early Paleozoic age are widespread in the Six Mile thrust sheet (Nelson and others, 1989). A distinctive quartz-garnet rock (goodrite) and various types of mostly Paleozoic plutonic gneiss, pegmatite, and quartz veins also are found in this thrust sheet, which structurally overlies the Chauga–Wallhalla thrust complex.

Paris Mountain Thrust Sheet

The Paris Mountain thrust sheet consists chiefly of sillimanite schist, quartzite, and amphibolite of Late Proterozoic to early Paleozoic age and granite gneiss of Paleozoic age (Nelson and others, 1989). It has been thrust over the Six Mile thrust sheet.

Laurens Thrust Sheet

The principal rock types of the Laurens thrust sheet are layered biotite gneiss, amphibolite, hornblende gneiss, mica schist, sillimanite schist, marble, and magnetite-bearing quartzite, all of Late Proterozoic to early Paleozoic age (Nelson and others, 1989). Also included are Paleozoic granitic and granodioritic gneiss. The Laurens thrust sheet structurally overlies the Six Mile and Paris Mountain thrust sheets (Art Nelson, USGS, written commun., 1990).

ROCKS SOUTHEAST OF THE LOWNDESVILLE SHEAR ZONE

Mafic–Ultramafic Thrust Sheet

A melange of probable Late Proterozoic to early Paleozoic age that contains fragmental ultramafic and mafic rocks in a quartzofeldspathic matrix and several different granitic bodies of Paleozoic age is near the south border of the Greenville quadrangle southeast of the Lowndesville shear zone (Nelson and others, 1989). This melange, which is at least partly equivalent to the Jacksons melange of Higgins and others (1989), may be a separate thrust sheet. To the northeast, these rocks are bordered by the volcanic-arc assemblage of Charlotte thrust sheet. The boundary between the melange and the volcanic arc has not been observed but is inferred to be a thrust fault.

Charlotte Thrust Sheet

Metamorphosed volcanic and related sedimentary rocks of Late Proterozoic to early Paleozoic age, together with plutonic rocks of Paleozoic age, make up a volcanic-arc assemblage, which may or may not represent a distinct thrust sheet or thrust complex (Nelson and others, 1989). These rocks have been traditionally included in the Kings Mountain belt, Charlotte belt, and Carolina slate belt (fig. 1*B*; King, 1955; Overstreet and Bell, 1965a, b). The rocks include metasandstone, metasiltstone, phyllite, quartzite, metagraywacke, biotite gneiss, biotite schist, quartzofeldspathic gneiss, mica schist, and various types of granitoid gneiss. The Charlotte thrust sheet also has relatively unmetamorphosed mafic igneous complexes of Paleozoic age that range in composition from gabbro to syenite and diorite (Butler and Ragland, 1969). The Charlotte volcanic-arc assemblage and adjacent melange complex overlie rocks of the Six Mile and Laurens thrust sheets along the Lowndesville shear zone.

GOLD

Known Gold Production

At least 90 percent of the gold produced in the Greenville quadrangle (table 1) has been from numerous small deposits in Lumpkin and White Counties, Ga., that extend for a linear belt known as the Dahlonega gold belt (fig. 4). The few mines and prospects in the northeastern part of the Dahlonega gold belt in Habersham and Rabun Counties, Ga., have produced only minor amounts of gold.

Other production gold areas in the Georgia part of the quadrangle as described by Jones (1909, p. 35–38) are the Hall County belt in Rabun, Habersham, Hall, Forsyth, and Gwinnett Counties; the Coosa Creek and Gum Log belts in Union and Towns Counties; the Hightower Creek belt in Towns County; the Madison County belt in Elbert and Madison Counties; and an isolated area in Hart County (see map). None of these areas has been a large gold producer.

None of the 29 scattered gold prospects and mines known in the South Carolina part of the quadrangle has been a large producer (table 1). The largest gold production in this part of South Carolina came from placer deposits in Spartanburg County along the Middle Tiger River several miles north of the Greenville quadrangle.

To a large extent the gold belts of Georgia as described by Jones (1909) fall within separate thrust sheets, and even the scattered deposits in South Carolina tend to be restricted to certain thrust sheets (see map). The gold resources are discussed in terms of their locations within thrust sheets, from northwest to southeast.

Gold Resources

Great Smoky Thrust Sheet

The Great Smoky thrust sheet in the northwest corner of the Greenville quadrangle (see map) contains the Coosa Creek and Gum Log gold belts of Jones (1909, p. 237–248). The Coosa Creek belt in the Greenville quadrangle is about 9 mi long and trends northeast in Union County, Ga. The Gum Log belt, about 5 mi long, extends northeast from Union to Towns Counties, Ga., and a short distance into Clay County, N.C. The Coosa Creek belt has at least nine lode deposits mostly toward the northeast end that were prospected during the 19th century, and an extensive placer deposit along Coosa Creek at the southwest end worked mostly during the 19th century (Yeates and others, 1896, p. 129–131; Jones, 1909, p. 237–238). The Gum Log belt has at least 13 lode and several small placer deposits. These were worked intermittently during the last half of the 19th century and first decade of the 20th. Most of the deposits in the Gum Log belt was visited during this study, and their locations on the map can only be approximated from descriptions by Yeates and others (1896), Jones (1909), and Pardee and Park (1948). Yeates and others (1896, p. 131) credited the Coosa Creek placers with a production of 20,000 to 50,000 oz of gold, but this amount seems nearly 10 times the recorded production for Towns and Union Counties in less than 2,000 troy oz of gold and more reasonable estimated production is 10,000 troy oz (table 1).

Lode gold deposits in the two belts are mostly in the Wehutty and Hothouse Formations of the Great Smoky Group (Nelson and others, 1989). The northwest-trending deposits of the Coosa Creek belt are in the Copperhill Formation in the lower part of the Great Smoky Group. The deposits are mostly in thin quartz veins, stringers, and pods that generally are parallel to the regional foliation or layering of the metasedimentary host rocks. The Murdock vein deposit in the Gum Log belt is described as a fissure vein that crosscuts the regional foliation at a right angle (Jones, 1909, p. 248). The veins and stringers commonly contain only minor amounts of pyrite. In the past 20 years, extensive geochemical sampling has been carried out in similar rocks of the Great Smoky Group in U.S. Forest Service wilderness and roadless areas as to the west of the Greenville quadrangle in Georgia and to the northeast in North Carolina and Tennessee (fig. 5) and in the Coker Creek gold district in Tennessee (Hale, 1974). These studies indicate the widespread occurrence of traces of gold in vein quartz and in the surrounding host sedimentary rocks, generally in amounts less than 1 part per million (ppm). During the prolonged weathering that has taken place in the Blue Ridge since Middle Paleozoic time, small amounts of gold were concentrated in saprolite and soil (Kinkel and Lesure, 1968). Erosion concentrated this gold in stream sediments to form placer deposits, especially in first- and second-order drainage basins. The presence of these placer deposits, however, does not necessarily imply the existence of large lode deposits in the headwaters of the drainage. The Coosa Creek placers clearly demonstrate this because no large lode deposits have been found despite extensive prospecting in the headwaters of this stream (Jones, 1909, p. 238). On the basis of this widespread occurrence of gold and the long period during which the area has undergone weathering, the rocks of the Great Smoky Group in the Great Smoky thrust sheet are deemed to have a low to moderate potential for the occurrence of additional small, low-grade lode gold deposits and small gold placers, each probably having less than 1,000 troy oz of contained Au (fig. 6). Most of the first- and second-order streams, which should retain most of the alluvial gold, have narrow valleys and small amounts of alluvium that constrain the size of any potential placers.

Rocks of the Great Smoky Group exposed within the Brasstown Bald window also contain trace amounts of gold (Welsh, 1985). Although detailed mapping is incomplete inside the window, areas containing traces of gold in stream sediments may be underlain by rocks correlative to the Wehutty and Hothouse Formations (R.P. Koeppen, oral commun., 1990). The gold is fine grained and difficult to recover by panning. The low grades, lack of large volumes of alluvium, and fine-grained nature of the gold preclude any significant resource potential for rocks within the window (Welsh, 1985, p. 11).

Richard Russell Thrust Sheet

The Richard Russell thrust sheet contains a small area of gold placers in the Hightower Creek belt of Jones (1909, p. 235–237) and a few other widely scattered gold occurrences. Geochemical studies in 10 wilderness and roadless areas in the thrust sheet (fig. 5) indicate the widespread distribution of trace amounts (<1 ppm) of gold in quartz veins and mica grabs and schist within rocks of the Richard Russell Formation that make up the thrust sheet. Similar studies in Habersham and White Counties, Ga., indicate the widespread occurrence of trace amounts of fine gold in stream sediments (Hunt and Crawford, 1964, p. 16; Hunt and Oswald, 1964, p. 18). Small placer deposits have been developed locally in first- and second-order drainages, but the stream valleys are narrow and contain limited amounts of alluvium. The gold resources are, therefore, small.

Several of these small placer deposits have been worked to a limited extent along five or more tributaries to Hightower Creek in northeastern Towns County, Ga. No lode deposits are known in the area. The gold is probably derived from the quartz veins in the host rock and also may be in some of the many quartz veins and segregations found in the area. Several prospect pits on the ridges just east of the placer deposits expose quartz veins, but no gold was detected in representative samples taken from the pits (Piper and others, 1991). This area could not have produced very much gold, probably less than 1,000 troy oz. The stream valleys are small and the areas underlain by alluvium are only 1 to 10 acres in size. The potential for additional deposits is low to moderate in the Hightower Creek belt (fig. 6), and the amount of gold to be found is probably small.

The Tom Coward massive sulfide prospect ≥ 2 mi east of the area of gold placers and across the crest of the ridge from Hightower Creek, drains into the Hightower Creek. The Tennessee Corp. in 1963 outlined a small body of massive pyrite–pyrrhotite that has minor amounts of chalcopyrite and sphalerite. Gold contents were not reported. Panned-concentrate samples taken from adjacent streams, however, contain traces of gold (Piper and others, 1991).

Helen Thrust Sheet

The Helen thrust sheet in the Greenville quadrangle contains the well-known Dahlonega gold belt, some of an early gold rush in 1830. Fighting between the miners and the Cherokee Indians ended with the forced removal of the people in 1838 (Blake and Jackson, 1859; Otwell, 1984, p. 5), and the continued gold production resulted in the establishment of a branch of the U.S. Mint in Dahlonega in the same year (Yeates and others, 1896, p. 30).

The Dahlonega gold belt is an elongate, narrow mineralized zone that extends from Hamilton County, Ga., northeast to Rabun County, Ga. (fig. 4, map). The northeast half and most productive part of the belt extends from Lumpkin and White Counties, mostly within the Greenville quadrangle. Only a few gold deposits are known in Habersham and Rabun Counties. The early mining centered on short vertical shafts and short adits on the lode deposits and even dry gulches where this narrow deposits of alluvium yielded much coarse alluvial gold (Featherstonhaugh, 1847). Within a few years the miners discovered gold in quartz veins and stringers in bedrock and began mining saprolite deposits along the hillsides. The early workings were generally mined out by 1850, yielding many of the miners left the region for the gold fields of California. By the late 1850's, hydraulic mining methods that had been developed in California were being introduced into the Dahlonega district (Blake and Jackson, 1859). After the Civil War a type of hydraulic mining adapted to local conditions, the so-called Dahlonega method (Nitze and Wilkens, 1897, p. 107–115), was used to mine gold in saprolite, and a second gold rush and mining lasted from the late 1860's until about 1911 (Purdee and Park, 1948, p. 31–32). Little mining has been done in the district since then.

Gold deposits in the Dahlonega belt are in rocks of the Helen Group (Nelson and Gillon, 1985) consisting of metamorphosed sedimentary and volcanic rocks. Most of the ore is in quartz veins and stringers, and some of the gold is associated with sulfides. Most mines were in the belt of mica schist in South Carolina. Several large gold mines were located in the regional foliation. These structures provided conditions favorable for the deposition of this mineral. The lode deposits are generally tabular bodies of silicification in the country rock, called stringer lands by Becker (1895, p. 281–284). Recent work by Pardee and Park (1948) indicates that such deposits is small. Silver is also present in the massive sulfide deposits. At the Saluda mine the silver content ranges from trace to 1.8 percent and averages about 0.4 troy ounce per ton.

Traces of silver, 0.5 to 1 ppm, are found in 155 out of 1,145 NURE stream-sediment samples in the Greenville quadrangle (Ferguson, 1978). Only four of these samples contain detectable gold, although gold was found in a total of 103 other samples. The drainage basins for the samples containing silver are located in all of the thrust sheets except the Charlotte (G.C. Curtin, USGS, unpub. data, 1992) and do not seem to form significant clusters.

Nineteen out of 1,477 heavy-mineral concentrates of stream sediment from the quadrangle also contains silver in amounts ranging from 0.5 to 100 ppm (G.C. Curtin, USGS, unpub. data, 1992), and 11 of these samples also contain gold. The drainage basins from which the silver-bearing concentrate samples came rarely overlap those from the NURE data, su