

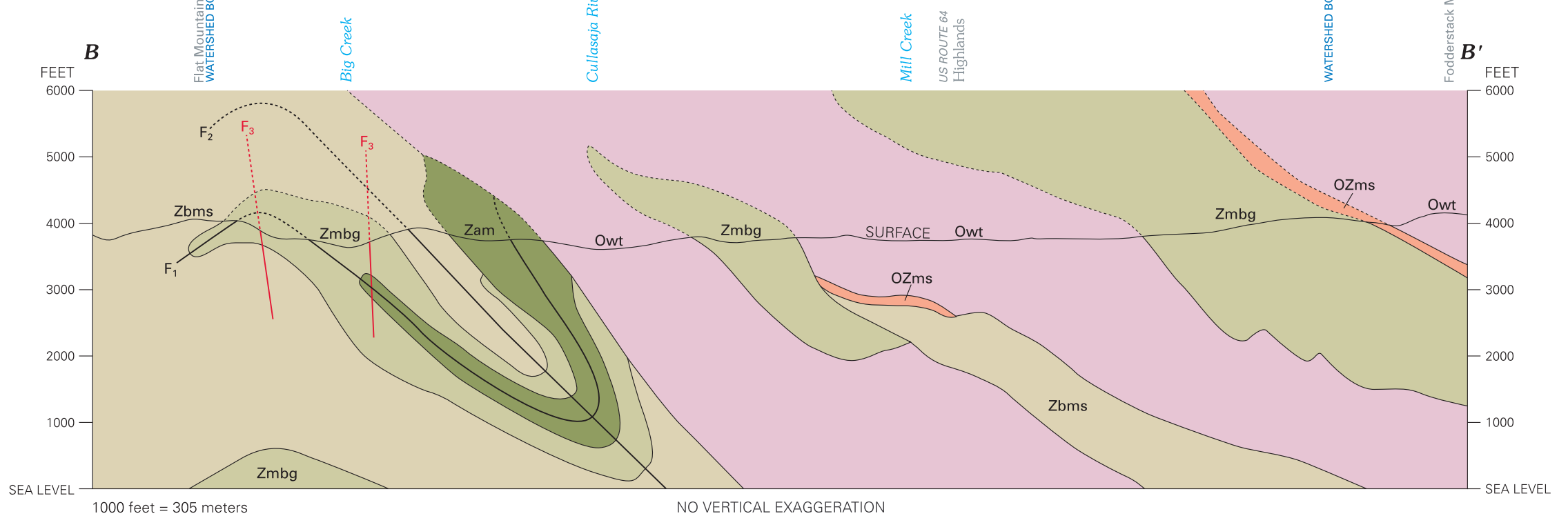
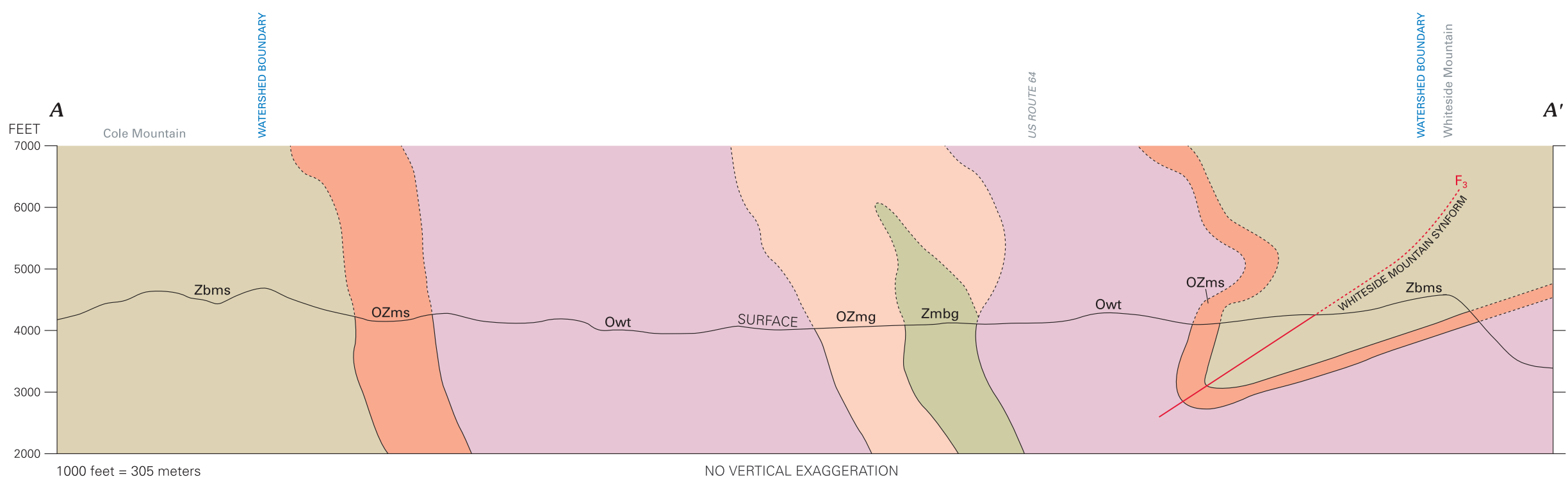
Base from U.S. Geological Survey and Tennessee Valley Authority, 1:24,000  
Highlands, 1946 (photorevised 1980)  
Polyconic projection, 1927 North American Datum  
10,000-foot grid ticks based on Tennessee rectangular coordinate system.  
1,000-meter Universal Transverse Mercator grid ticks, zone 17, shown in blue

APPROXIMATE MEAN  
OCCURRENCE DATE

SCALE 1:24,000  
1 0 1000 2000 3000 4000 5000 6000 7000 FEET  
1 0 1 2 KILOMETER  
CONTOUR INTERVAL 40 FEET  
NATIONAL GEODETIC VERTICAL DATUM OF 1929

MAP LOCATION

Geology mapped in 2001 and 2002  
Digital compilation by Boris J. Barrios



### CORRELATION OF MAP UNITS

Plutonic rocks	Migmatitic rocks	Metasedimentary and metavolcanic rocks
Aplite and pegmatite dikes Owt	Whiteside trondhjemite OZmg, OZms	Ashe Metamorphic Suite Zbms, Zmbg, Zam

ORDOVICIAN } PALEOZOIC  
NEOPROTEROZOIC } PROTEROZOIC

### DESCRIPTION OF MAP UNITS

(Minerals listed in order of increasing abundance)

- Owt** Whiteside trondhjemite (Ordovician)—White to light-gray, medium-grained, massive to well-foliated, locally gneissic microcline (10 percent) - muscovite (10 percent) - biotite (10 percent) - quartz (35 percent) - plagioclase (35 percent) trondhjemite and minor granodiorite. Apatite and garnet are accessory minerals. Weathers into gray and pale-yellow saprolite; underlies areas of high relief as cliffs, and areas of low relief. Fracturing is predominantly sheeting joints.
- OZmg** Muscovite-biotite migmatitic gneiss (Ordovician and Neoproterozoic)—Light- and dark-banded, mostly fine-grained muscovite (15 percent) - biotite (15 percent) - quartz (30 percent) - plagioclase (40 percent) migmatitic gneiss consisting of centimeter-scale gneissic interlayering of dark-gray, medium-grained to mostly fine-grained muscovite-biotite-rich metabasites and white, fine-grained to mostly medium-grained plagioclase-quartz-microcline leucosomes. Migmatization is considered to be Ordovician in age. Defines broad zones along contacts between Whiteside trondhjemite and gneissic country rock; more resistant to weathering than country rock. Commonly contains tight folds. Sheeting joints predominate over foliation-parallel parting.
- OZms** Biotite-muscovite migmatitic schist (Ordovician and Neoproterozoic)—Light- and dark-banded, mostly medium-grained biotite (20 percent) migmatitic schist consisting of centimeter-scale interlayering of dark-gray, fine-grained to mostly medium-grained schistose metabasites and white, fine-grained to mostly medium-grained plagioclase-quartz-microcline leucosomes. Migmatization is considered to be Ordovician in age. Defines broad zones along contacts between Whiteside trondhjemite and gneissic country rock; more resistant to weathering than country rock. Commonly contains tight folds. Sheeting joints predominate over foliation-parallel parting.

### Ashe Metamorphic Suite (Neoproterozoic)

- Zbms** Biotite-muscovite schist—Well-foliated, gray to tan weathering, fine-grained to mostly medium-grained garnet (5 percent) - plagioclase (15 percent) - biotite (20 percent) - muscovite (30 percent) - quartz (30 percent) schist. Locally contains up to a few percent each of kyanite, sillimanite, and (or) apatite. Weathers easily into reddish-yellow saprolite; underlies areas of moderate relief. Fracturing is predominantly foliation-parallel parting.
- Zmbg** Muscovite-biotite gneiss—Well-foliated to finely layered, dark-gray, medium-grained to mostly fine-grained muscovite (15 percent) - biotite (15 percent) - plagioclase (30 percent) - quartz (30 percent) gneiss. Apatite is a common accessory mineral. May contain centimeter-scale layers of plagioclase-hornblende amphibolite. Weathers easily into grayish-yellow saprolite. Fracturing is predominantly foliation-parallel parting.
- Zam** Amphibolite—Gray to ruddy weathering, dark-green to black, fine-grained, well-foliated quartz (10 percent) - plagioclase (35 percent) - hornblende (55 percent) gneiss (amphibolite). Locally contains as much as 5 percent sillimanite, epidote, sphene and limonite locally are common accessories. Found as map-scale layers within muscovite-biotite gneiss (Zmbg) and biotite-muscovite schist (Zbms). Weathers easily into deep-red saprolite. Highly fractured, with both foliation-parallel parting and closely-spaced cross fractures.

### EXPLANATION OF MAP SYMBOLS

- Contact—Dashed where approximately located; dotted where concealed by water. Distribution and concentration of structural symbols and outcrops indicate reliability of contact.
- Watershed boundary

### FOLDS

Major (map-scale) folds—Showing axial trace, dip direction of axial surface, and, where known, local plunge direction of fold hinge. Relative ages indicated by subscript the greater the subscript number, the younger the fold.

- F<sub>1</sub> Upright F<sub>1</sub> antiform

### PLANAR AND LINEAR FEATURES

(Where a planar feature is combined with another planar feature or a linear feature, intersection of symbols marks point of observation. Where a planar feature is combined with another planar feature that is combined with a linear feature, intersection of the planar symbols marks point of observation. Minor folds are outcrop-scale folds.)

### PLANAR FEATURES

- Strike and dip of S<sub>1</sub> foliation, gneissosity, or schistosity
  - Inclined
  - Vertical
- Strike and dip of layer-parallel S<sub>1</sub> gneissosity or schistosity
  - Inclined
  - Vertical
- Strike and dip of S<sub>2</sub> foliation, gneissosity, or schistosity
  - Inclined
  - Vertical
- Strike and dip of layer-parallel S<sub>2</sub> gneissosity or schistosity
  - Inclined
- Strike and dip of axial plane of F<sub>1</sub> or F<sub>2</sub> minor fold or crenulation
  - Inclined
  - Vertical
- Strike and dip of axial surface of F<sub>2</sub> minor fold
  - Inclined
  - Vertical
- Strike and dip of axial surface of F<sub>1</sub> minor fold
  - Inclined
  - Vertical
- Strike and dip of minor fault with slickensided surface—Arrow shows bearing and plunge of slickensides
  - Inclined
  - Vertical
- Left-lateral minor fault
  - Inclined
  - Vertical
- Strike and dip of pegmatite or apatite dike
  - Inclined
  - Vertical
- Strike and dip of quartz vein
  - Inclined
  - Vertical

### LINEAR FEATURES

- Bearing and plunge of mineral lineation of F<sub>2</sub> age
- Bearing and plunge of F<sub>2</sub> or F<sub>1</sub> minor fold axis
- Bearing and plunge of F<sub>2</sub> minor fold axis
- Bearing and plunge of F<sub>1</sub> minor fold axis

### OTHER FEATURES

- Sampling locality for <sup>40</sup>Ar/<sup>39</sup>Ar dating of metamorphic minerals—See Table 1 in explanatory text file on this CD-ROM
- Area of outcrop examined in this study

## BEDROCK GEOLOGIC MAP OF THE HEADWATERS REGION OF THE CULLASAJA RIVER, MACON AND JACKSON COUNTIES, NORTH CAROLINA

By  
William C. Burton  
2007

