DIVISION OF LAND RESOURCES
DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES

NORTH CAROLINA GEOLOGICAL SURVEY
GEOLOGIC MAP SERIES-10B

LOCATION OF GORGES STATE PARK,
TRANSYLVANIA COUNTY, NORTH CAROLINA

MAP OF SLOPE MOVEMENTS AND RELATED SURFICIAL DEPOSITS GORGES STATE PARK, TRANSYLVANIA COUNTY, NORTH CAROLINA

BY

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2003

Base topographic map modified from Tennessee Valley Authority and U. S. Geological Survey, 1946, by North Carolina Geological Survey, 2001.

Slope movement and related surficial deposits map cartography and by North Carolina Geological Survey.

Slope movement and surficial geology by Richard M. Wooten, Carl E. Merschat, and Mark W. Carter 1999-2003. Accompainies the Bedrock Geologic Map of Gorges State Park, Geologic Map Series 10A, by Carl E. Merschat, Mark W. Carter,and Richard M. Wooten, 2003.

SCALE 1:12,000

0 — 1/2 — 1 MILE

1000 0 1000 2000 3000 FEET

0 .5 1 KILOMETER

CONTOUR INTERVAL 40 FEET

NATIONAL GEODETIC VERTICAL DATUM OF 1929

ACKNOWLEDGEMENTS

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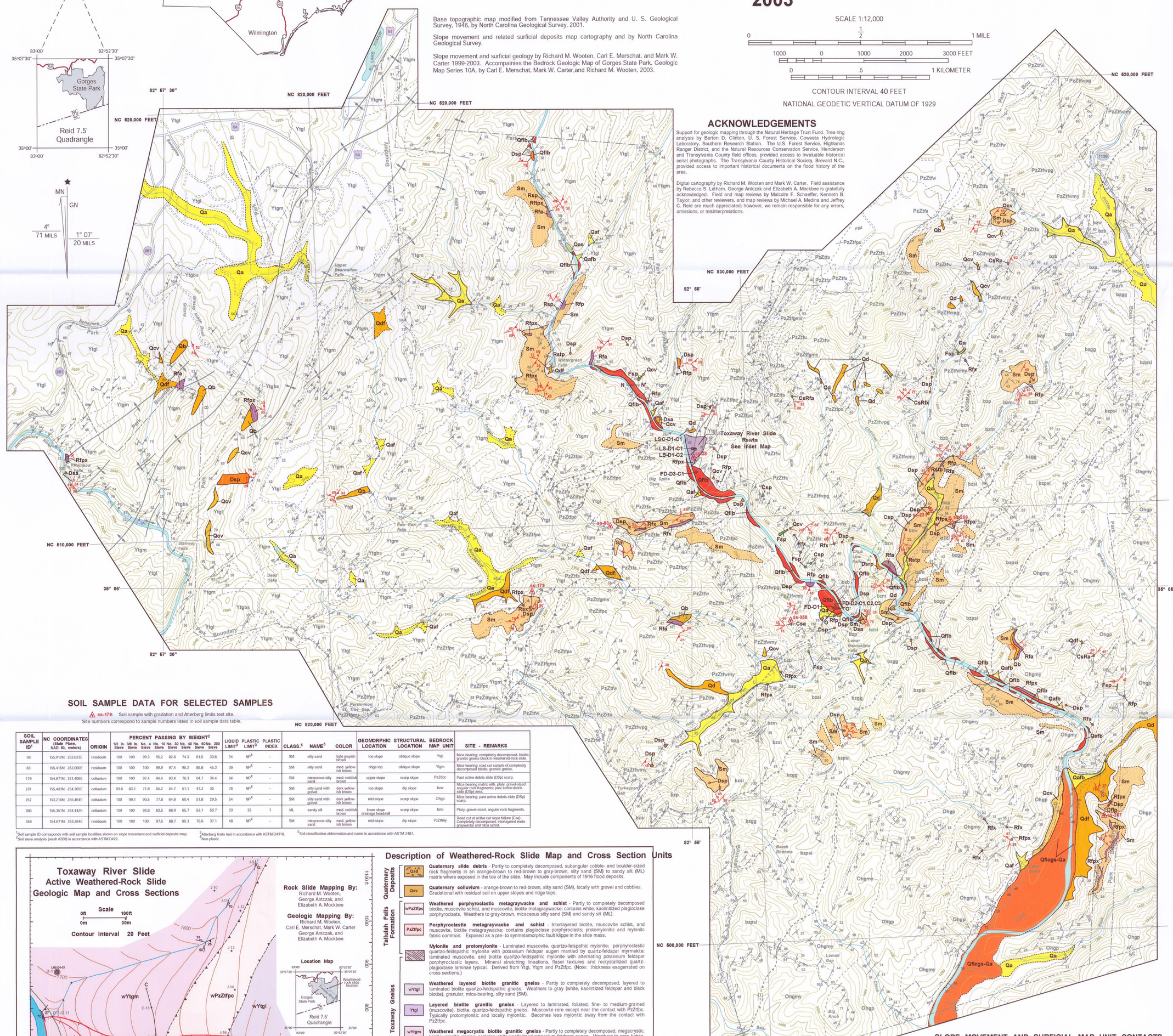
Digital cartography by Richard M. Wooten and Mark W. Carter. Field assistance by Rebecca S. Latham, George Antczak and Elizabeth A. Mockbee is gratefully acknowledged. Field and map reviews by Malcolm F. Schaeffer, Kenneth B. Taylor, and other reviewers, and map reviews by Michael A. Medina and Jeffrey C. Reid are much appreciated; however, we remain responsible for any errors, omissions, or misinterpretations.

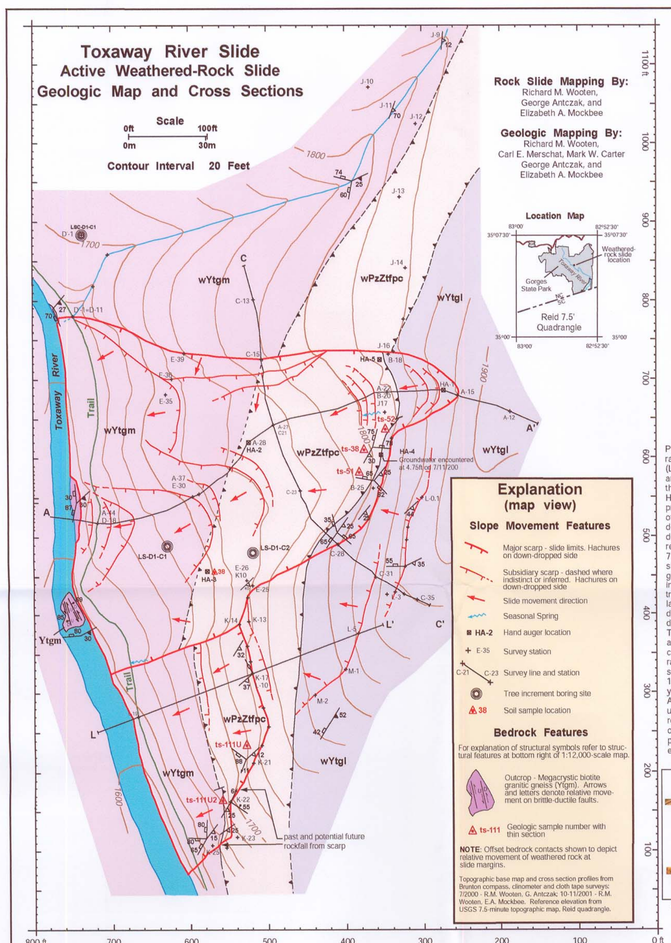


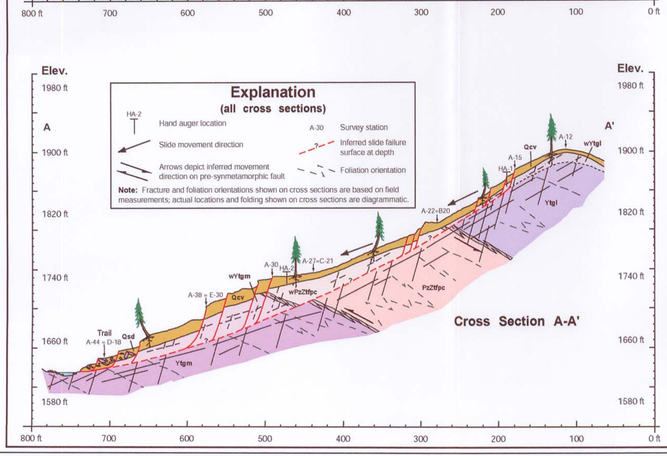
SOIL SAMPLE DATA FOR SELECTED SAMPLES

⚠ ss-179: Soil sample with gradation and Atterberg limits test site.
Site numbers correspond to sample numbers listed in soil sample data table.

SOIL SAMPLE ID[1]	NC COORDINATES (State Plane, NAD 83, meters)	ORIGIN	PERCENT PASSING BY WEIGHT[2] 1/2 in. Sieve	3/8 in. Sieve	No. 4 Sieve	No. 10 Sieve	No. 30 Sieve	No. 40 Sieve	No. 60 Sieve	No. 200 Sieve	LIQUID LIMIT[3]	PLASTIC LIMIT[3]	PLASTIC INDEX	CLASS.[5]	NAME[5]	COLOR	GEOMORPHIC LOCATION	STRUCTURAL LOCATION	BEDROCK MAP UNIT	SITE - REMARKS
38	155,912N: 252,623E	residuum	100	100	99.3	95.2	82.8	74.3	61.5	30.6	34	NP[4]	--	SM	silty sand	light grayish brown	toe slope	oblique slope	Ytgl	Mica-bearing; completely decomposed, biotite, granitic gneiss block in weathered-rock slide.
83	155,415N: 252,000E	residuum	100	100	100	99.9	97.4	95.2	88.8	45.3	36	NP[4]	--	SM	silty sand	med. yellow-ish brown	ridge top	oblique slope	Ytgm	Mica-bearing; road cut sample of completely decomposed biotite, granitic gneiss.
179	154,871N: 251,406E	colluvium	100	100	97.4	94.4	83.4	76.3	64.7	34.4	64	NP[4]	--	SM	micaceous silty sand	med. reddish brown	upper slope	scarp slope	PzZtfpc	Past active debris slide (DSp) scarp.
231	155,443N: 264,305E	colluvium	93.6	83.1	71.8	65.2	54.7	51.1	47.2	36	76	NP[4]	--	SM	silty sand with gravel	dark yellow-ish brown	toe slope	dip slope	bzw	Mica-bearing matrix with, platy, gravel-sized, angular rock fragments; past active debris slide (DSp) area.
257	153,216N: 255,464E	colluvium	100	99.1	90.5	77.8	64.8	60.4	51.8	29.5	64	NP[4]	--	SM	silty sand with gravel	dark yellow-ish brown	mid-slope	scarp slope	Ohgp	Mica-bearing; past active debris slide (DSp) scarp.
286	155,351N: 254,442E	colluvium	100	100	93.8	83.5	68.9	65.7	62.1	50.7	33	32	1	ML	sandy silt	med. reddish brown	lower slope drainage headwall	scarp slope	bzsi	Platy, gravel-sized, angular rock fragments.
358	154,671N: 253,264E	residuum	100	100	100	97.5	88.7	85.3	76.6	37.1	48	NP[4]	--	SM	micaceous silty sand	med. yellow-ish brown	mid-slope	dip slope	PzZtfmy	Road cut at active cut slope failure (Csa). Completely decomposed, interlayered meta-graywacke and mica schist.

[1]Soil sample ID corresponds with soil sample localities shown on slope movement and surficial deposits map.
[2]Soil sieve analysis (wash #200) in accordance with ASTM D422.
[3]Atterberg limits test in accordance with ASTM D4318.
[4]Non-plastic
[5]Soil classification abbreviation and name in accordance with ASTM 2487.





Description of Weathered-Rock Slide Map and Cross Section Units

Quaternary Deposits

Qad Quaternary slide debris - Partly to completely decomposed, subangular cobble- and boulder-sized rock fragments in an orange-brown to red-brown to gray-brown, silty sand (SM) to sandy silt (ML) matrix where exposed in the toe of the slide. May include components of 1916 flood deposits.

Qcv Quaternary colluvium - orange-brown to red-brown, silty sand (SM), locally with gravel and cobbles. Gradational with residual soil on upper slopes and ridge tops.

Talluah Falls Formation

wPzZtfpc Weathered porphyroclastic metagraywacke and schist - Partly to completely decomposed biotite, muscovite schist, and muscovite, biotite metagraywacke; contains white, kaolinitized plagioclase porphyroclasts. Weathers to gray-brown, micaceous silty sand (SM) and sandy silt (ML).

PzZtfpc Porphyroclastic metagraywacke and schist - Interlayered biotite, muscovite schist, and muscovite, biotite metagraywacke; contains plagioclase porphyroclasts; protomylonitic and mylonitic fabric common. Exposed as a pre- to synmetamorphic fault klippe in the slide mass.

Mylonite and protomylonite - Laminated muscovite, quartzo-felspathic mylonite; porphyroclastic quartzo-feldspathic mylonite with potassium feldspar augen mantled by quartz-feldspar myrmekite; laminated muscovite, and biotite quartzo-feldspathic mylonite with alternating potassium feldspar porphyroclastic layers. Mineral stretching lineations, flaser textures and recrystallized quartz-plagioclase laminae typical. Derived from Ytgl, Ytgm and PzZtfpc. (Note: thickness exaggerated on cross sections.)

Toxaway Gneiss

wYtgl Weathered layered biotite granitic gneiss - Partly to completely decomposed, layered to laminated biotite quartzo-feldspathic gneiss. Weathers to gray (white, kaolinitized feldspar and black biotite), granular, mica-bearing, silty sand (SM).

Ytgl Layered biotite granitic gneiss - Layered to laminated, foliated, fine- to medium-grained (muscovite), biotite, quartzo-feldspathic gneiss. Muscovite rare except near the contact with PzZtfpc. Typically protomylonitic and locally mylonitic. Becomes less mylonitic away from the contact with PzZtfpc.

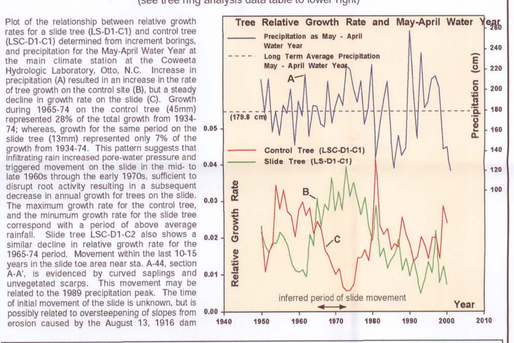
wYtgm Weathered megacrystic biotite granitic gneiss - Partly to completely decomposed, megacrystic, biotite, granitic gneiss; contains white kaolinitized potassium feldspar augen. Weathers to gray (white, kaolinized feldspar and black biotite), granular, mica-bearing silty sand (SM).

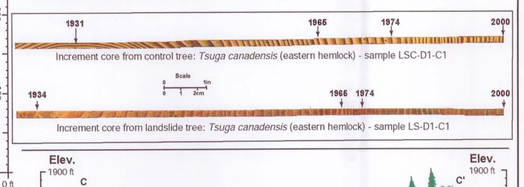
Ytgm Megacrystic biotite granitic gneiss - Megacrystic potassium feldspar augen in a medium-grained, foliated, (muscovite), biotite, quartzo-feldspathic groundmass. Muscovite rare except near contact with

Slide Movement Inferred From Tree Ring Analysis

(see tree ring analysis data table to lower right)

Plot of the relationship between relative growth rates for a slide tree (LS-D1-C1) and control tree (LSC-D1-C1) determined from increment borings, and precipitation for the May-April Water Year at the main climate station at the Coweeta Hydrologic Laboratory, Otto, N.C. Increase in precipitation (A) resulted in an increase in the rate of tree growth on the control site (B), but a steady decline in growth rate on the slide (C). Growth during 1965-74 on the control tree (45mm) represented 28% of the total growth from 1934-74; whereas, growth for the same period on the slide tree (13mm) represented only 7% of the growth from 1934-74. This pattern suggests that infiltrating rain increased pore-water pressure and triggered movement on the slide in the mid- to late 1960s through the early 1970s, sufficient to disrupt root activity resulting in a subsequent decrease in annual growth for trees on the slide. The maximum growth rate for the control tree, and the minumum growth rate for the slide tree correspond with a period of above average rainfall. Slide tree LSC-D1-C2 also shows a similar decline in relative growth rate for the 1965-74 period. Movement within the last 10-15 years in the slide toe area near sta. A-44, section A-A', is evidenced by curved saplings and unvegetated scarps. This movement may be related to the 1989 precipitation peak. The time of initial movement of the slide is unknown, but is possibly related to oversteepening of slopes from erosion caused by the August 13, 1916 dam



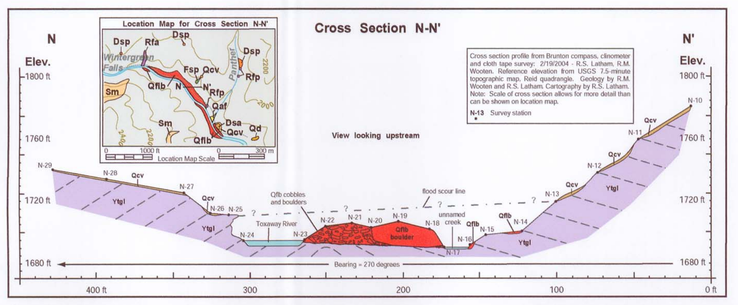


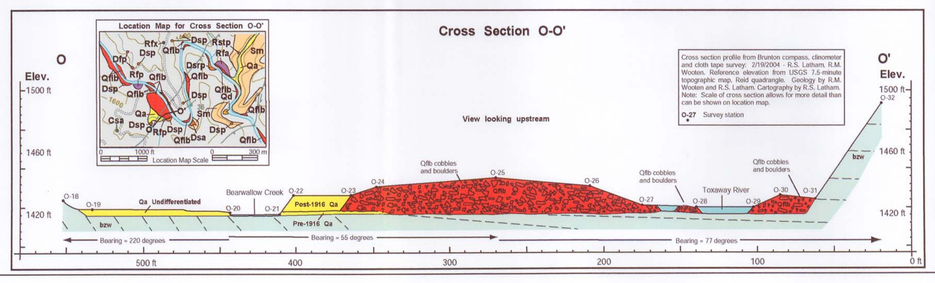
TREE RING ANALYSIS DATA

◎ FD-D2-C1: Tree ring increment boring site. Site numbers correspond to sample ID numbers listed in tree ring data table.

SAMPLE ID[1]	NC COORDINATES (State Plane, NAD 83, meters)	SPECIES	SAMPLE TYPE (sampled 6/25/2001)	NUMBER OF CORES	CORE LENGTH[2] (cm)	TREE DIAMETER[3] (cm)	AGE (yrs)	BEGINNING GROWTH YEAR	SITE - REMARKS
FD-D1	154,771N: 253,566E	*Pinus strobus* (eastern white pine)	stump	0	N/A	71.0	65-70	1931-1936	Flood boulder deposit margin.
FD-D2-C1	154,779N: 253,592E	*Pinus rigida* (pitch pine)	increment bore live tree	1	24.8	49.5	84	1917	Flood boulder levee. Indicates flood deposits pre-date 1917.
FD-D2-C2	154,775N: 253,601E	*Pinus strobus* (eastern white pine)	increment bore live tree	1	29.2	58.4	72-77	1924-1929	Flood boulder levee.
FD-D2-C3	154,792N: 253,591E	*Pinus rigida* (pitch pine)	increment bore live tree	1	29.8	59.7	76-78	1925-1927	Flood boulder levee.
FD-D3-C1	155,785N: 252,644E	*Pinus strobus* (eastern white pine)	increment bore live tree	1	30.5	61	56+	1945	Flood boulder deposit; minimum age - no pith in core.
LS-D1-C1	155,931N: 252,619E	*Tsuga canadensis* (eastern hemlock)	increment bores curved live tree	5	30.3	60.6	64-76	1925-1937	Active weathered-rock slide. Narrower rings indicate slide movement from ~1965 to 1974.
LS-D1-C2	155,928N: 252,628E	*Acer rubrum* (red maple)	increment bores curved live tree	3	27.2	54.4	70-100	1901-1931	Active weathered-rock slide. Narrower rings indicate slide movement from ~1965 to 1974.
LSC-D1-C1	156,087N: 252,583E	*Tsuga canadensis* (eastern hemlock)	increment bores straight live tree	2	25.3	50.6	70+	1931	Control sample for rock slide on adjacent stable slope. Wider 1965-1974 rings indicate higher rainfall. Minimum age - no pith in core.

[1]Sample ID corresponds with tree ring analysis sites shown on slope movement and surficial deposits map.
[2]Mean length of cores where multiple cores taken.
[3]Diameter equals 2x core or mean core length.





SLOPE MOVEMENT AND SURFICIAL MAP UNIT CONTACTS

Solid Line - Field verified, located within approximately 100 ft.

Dashed Line - Interpreted from topographic map expression and stereographic aerial photographs.

AERIAL PHOTOGRAPHY USED

1. April 2, 1998, color infrared aerial photographs: approx. scale 1:56,000
2. October 10, 1963, black and white aerial photographs: approx. scale 1:20,000
3. April, 28, 1953, black and white aerial photographs; approx scale 1:20,000.
4. February 20, 1986, color aerial photographs; approx scale 1:15,840.
5. February 4, 1963, black and white aerial photographs; approx. scale 1:15,840

DESCRIPTION OF MAP UNITS

QUATERNARY ALLUVIUM

Qflb

Qflb - Boulder-dominated, overbank facies of the August 1916 flood deposits. These deposits along the Toxaway River originated mainly from the August 13, 1916 dam failure at Toxaway Lake, but may also include deposits from subsequent floods (e.g., August 1940, November 1977). Found mainly below Wintergreen Falls downstream to the confluence with Toxaway Creek at upper Lake Jocassee; isolated deposits along river bends occur upstream of Wintergreen Falls to the Park boundary. Characterized by chaotic deposits of subangular to subrounded boulders ranging in maximum dimension from 1 m to 12 m, with subordinate cobble and gravel fractions. Imbricated tabular boulders occur sporadically throughout.

Crests of boulder levees range from 2 m to 12 m above the present river level, and locally block and divert tributary streams. Sheet-like boulder and cobble deposits blanket broader areas of the flood plain near the confluence with Bearwallow Creek, and the northeast side of the river across from Big Spice Cove. Upstream from the confluence with Indian Creek boulders up to 3m constrict the river channel impounding stratified, sand-dominated alluvium.

Comprised of boulders of the Toxaway Gneiss (Ytgm and Ytgl) above the contact with the Tallulah Falls Formation (PzZtf). Mixed lithologies occur downstream from the respective contacts between bedrock map units that cross the Toxaway River.

After withstanding two hurricanes in early and mid-July 1916, the eathern dam failed around 7:10 p.m. on August 13, 1916 (August 14, 1916 *Greenville News*) following heavy rain that began the previcus night from another hurricane that had moved ashore from the Gulf of Mexico. Dr. S. W. McCallie, Georgia state geologist, is quoted in the August 18, 1916 *Savannah Union Times*, "An estimated 5,376,548,571 gallons of water changed hands."

Floodwaters scoured the river channel to bedrock for most of its length above Wintergreen Falls. Below the falls eroded colluvium and scoured bedrock surfaces, along with truncated alluvial fans occur along valley toe slopes. The absence of fines and the large particle size (up to 3 m x 4 m x 12 m) of the deposit indicate hyperconcentrated sreamflow.

Qficgs-Qa

Qficgs-Qa - Cobble-gravel-sand facies of the August 1916 flood deposits and subordinate undifferentiated post-1916 alluvium. Post-1916 flood deposits are likely included. Sheet-like valley fill occurs along and beneath Lake Jocassee downstream from Toxaway Creek south of the N.C.-S.C. state line. Recent cobble-gravel-sand alluvium occurs in, and along the Toxaway River channel. Subrounded to rounded rock clasts dominate the coarse fraction . On the west bank of upper Lake Jocassee, across from the confluence with Toxaway Creek, alluvial sand and gravel overlies boulder-cobble deposits ascribed to the Ausust 1916 flood. The upper finer-grained deposits may post-date the 1916 flood, or may be waning stage deposits of the 1916 torrent. Cumulative deposit thickness may be as much as 12m.

Qa

Qa - Quaternary alluvium undifferentiated. Sand, gravel and cobble stream deposits. Steeper gradient stream channels dominated by rounded gravel and cobbles with subordinate boulders. Along floodplains of streams with lower gradients includes dominantly stratified sand deposits as exposed along Bearwallow Creek near the confluence with the Toxaway River. Locally, fining-upward, poorly sorted cut-and-fill deposits with gravel-cobble bases incise laminar-stratified silt and sand.

Qas

Qas - Quaternary alluvium, sand dominated. Laminar-stratified sand with subordiate silt and gravel. Exposed upstream of Indian Creek in and along the Toxaway River channel.

Qafb

Qafb - Quaternary alluvial fan, boulder dominated. Predominantly flood deposits with boulders dominant over cobbles, gravel and sand; silt fraction minor to absent. May include reworked (winnowed) debris deposits. Well-exposed example along lower Toxaway Creek at the confluence with the Toxaway River.

Qaf

Qaf - Quaternary alluvial fan. Fan-shaped undifferentiated boulder, cobble and gravel deposits at stream outlets. Includes reworked debris.

QUATERNARY HILLSLOPE DEPOSITS

Qdf

Qdf - Quaternary debris fan. Lower slope accumulations of poorly sorted, silt- to boulder-sized material; clast- to matrix-supported with angular to rounded rock fragments. Matrix is tan, to medium brown, to red-brown silty sand (SM) to sandy silt (ML); typically with a minor clay component and boulders up to 2.25 m x 2 m x 1.5 m in near surface exposures. Composite deposit with alluvial, debris flow, debris slide and rockfall components. Incised and contains reworked debris along stream channels. Typically developed on footslopes below steep headwalls and cliff lines on scarp and oblique slopes. Well exposed on west-facing footslopes above upper Lake Jocassee.

Qd

Qd - Quaternary debris. Compositionally and texturally similar to debris fan deposits but confined to seasonal and perennial stream valleys, typically in lower gradient reaches. Includes colluvial and alluvial components.

Qb

Qb - Quaternary boulder field. Elongate deposits of angular to subangular boulders, usually downslope from outcrop areas. Includes rockfall and other colluvial components.

Qcv

Qcv - Quaternary colluvium undifferentiated. Lower slope and hillslope hollow deposits characterized by gravitational accumulations of clay, silt, sand, gravel, cobbles, and boulders, typically silty sand with gravel (SM) to silty gravel (GM). Mass wasting components subordinate, lacks fan morphology. Clay component minor but generally increases with the age of the deposit as reflected by the increased weathering of rock clasts (partly- to completely decomposed). Matrix ranges from medium brown to red-orange. Rock fragments typically angular to subangular.

QUATERNARY SLOPE MOVEMENTS

SLOPE MOVEMENT MODIFIERS

a - Active. Unvegetated to partially vegetated scarps, distinct margins, curved and leaning trees; freshly exposed rock surfaces in scarps and on boulders in areas of rockfall.

p - Past active. No obvious signs of movement, revegetated scarps, indistinct margins.

x - Potential movement. Areas of potential rockfall mainly beneath overhangs with favorably-oriented, dilated fractures.

w - Weathered rock - partly to completely decomposed state.

t - Translational movement dominant.

Ds

Ds - Debris slide. Typically small (<15 m wide x 20 m long) displaced masses of colluvial and residual soil accumulated on steep slopes (> 35º) just below head scarps delineated by arcuate hollows. Debris typically ranges from silty sand (SM) to silty gravel (GM) with subangular to angular rock fragments. Surface of rupture is typically at the soil-rock interface. Intense rainfall may mobilize the accumulated debris into rapidly moving debris flows.

Dfl

Dfl - Debris flow. Landforms characterized by a recognizeable scars, tracks and accumulations of transported debris at the toe of steep hillslopes. Tracks typically follow existing stream channels. Silt and sand contained in the initial deposit may be winnowed by subsequent stream action leaving a cobble- and boulder-dominated deposit. Debris flows typically originate on steep (> 35º) hillslopes following intense rainfall that mobilizes colluvial and residual soil into rapidly moving mixtures of silt, sand, rock fragments and plant debris. Detachment zones are typically at the soil-rock interface.

Rs

Rs - Rock slide. Downslope movement of a rock mass along one or more planar discontinuities such as fracture and foliation planes. The transported rock mass may be intact blocks, or disaggregated into boulder-sized fragments.

Rf

Rf - Rockfall. Detatchment of rock blocks from steep slopes or cliffs with little or no shear displacement. Rock blocks detach along discontinuities (foliations and fractures), and descend through the air by falling, bouncing or rolling and accumulate at the toes of slopes. Numerous rockfalls occur beneath rock overhangs defined by foliation planes along scarp and oblique slopes.

Sm

Sm - Areas with numerous small slope movements (<15m wide x 20m long) including debris and rock slides, rock fall, soil creep and soil buttressing by trees. Typically in areas of thin (~2m) colluvium and residuum and rock outcrop in steep drainage headwalls on scarp and oblique slopes. Also on dip slopes along Auger Fork Creek and Maple Spring Branch. Colluvium ranges from organic sandy silt (ML) to silty gravel (GM) typically in sharp contact with stained-state bedrock.

Cs

Cs - Cut slope failure. Slope movements related to the excavated slope of a road prism. Typically small (<10m wide) debris slides. Cut slope movements involving rock include abbreviations for the type of rock movement (e.g., CsRfp is a past active rockfall from a cut slope).

Fs

Fs - Fill slope failure. Slope movement related to embankment slope of a road prism. Typically debris slides, but includes some debris flows.

Slope movements classified according to:

Cruden, D.M., and Varnes, D.J., 1996, Landslide types and processes, *in* Landslides: Investigation and mitigation, edited by A. K. Turner and R. L. Schuster, Transportation Research board Special Report No. 247, National Research Council, National Academy Press, Washington, D.C., p. 36-75.

Varnes, D. J., 1978, Slope movement types and processes, *in* Landslide analysis and Control, edited by R.L. Schuster and R.J. Krizek, Transportation Research Board Special Report No, 176, National Academy of Sceinces, Washington, D.C., p. 11-23.

Rock weathering classified according to:

Williamson, D.A., 1984, Unified rock classification system: Bulletin of the Association of Engineering Geologists, vol. XXI, p. 253-254.

Other sources of information:

American Society for Testing and Materials, 2002, Standard method for particle-size analysis of soils, ASTM D433-63: *in* Annual Book of ASTM Standards, v. 04.08, Soil and Rock; Building Stones; Geotextiles; American Society for Testing and Materials, Philadelphia, PA.

American Society for Testing and Materials, 2002, Standard practice for classification of soils for engineering purposes (Unified Soil Classification System): *in* Annual Book of ASTM Standards, v. 04.08, Soil and Rock; Building Stones; Geotextiles; American Society for Testing and Materials, Philadelphia, PA.

American Society for Testing and Materials, 2002, Standard test methods for liquid limit, plastic limit and plastic index of soils: *in* Annual Book of ASTM Standards, v. 04.08, Soil and Rock; Building Stones; Geotextiles; American Society for Testing and Materials, Philadelphia, PA.

Barton, Tim, 1988, A history of the Auger Hole, encompassing a 9,600 acre tract of land (offered for public sale to a state or federal agency by Duke Power Co.) drained by the Toxaway River, in the southwest corner of Transylvania County, North Carolina: report prepared for the Sierra Club, Pisgah Group, 111p.

Marschat, C.E., Carter, M.W., and Wooten, R.M., 2003, Bedrock geologic map of Gorges State Park, Transylvania County. North Carolina: North Carolina Geological Survey Geologic Map Series 10A, scale 1:12,000.

Tennessee Valley Authority, 1964, Floods on French Broad River, Davidson River, King Creek, Nicholson Creek in the vicinity of Brevard, N. C.: Report No. 0-6373, TVA Division of Water Control Planning, Knoxville, TN., 98p.

Scott, R.C., Jr., 1972, Geomorphic significance of debris avalanching in the Appalachian Blue Ridge Mountains: Ph.D. dissertation, Univ. of Georgia, Athens, GA., 184p.

U. S. Dept. of Agriculture, Soil Conservation Service and Forest Service, 1974, Soil survey of Transylvania County, North Carolina: U. S. Government Printing Office, Washington, D. C., 71p. map scale 1:15,840.

BEDROCK MAP UNITS

(shown in gray on 1:12,000-scale map)

Refer to Geologic Map Series 10 A, bedrock geologic map, for map unit descriptions.

Cambrian to Ordovician(?)

HENDERSON GNEISS

- Ohgmy — mylonitic granitic gneiss
- Ohgp — protomylonitic granitic gneiss

BREVARD FAULT ZONE

Late Proterozoic to Early Paleozoic(?)

TALLULAH FALLS FORMATION

- PzZtfa — amphibolite
- PzZtfu — altered ultramafic rock
- PzZtfw — metagraywacke
- PzZtfwpg — pegmatitic metagraywacke
- PzZtfwmy — mylonitic metagraywacke
- PzZtfpc — porphyroclastic metagraywacke and schist
- PzZtfgms — Garnet-mica schist

PRE- TO SYNMETAMORPHIC FAULT

ROSMAN FAULT

ROCKS OF THE BREVARD ZONE

- bzb — graphitic schist and breccia
- bzw — metagraywacke
- bzp — phyllonite
- bzm — siliceous marble
- bzsl — metasiltstone
- bzgg — mylonitic granitic gneiss (Henderson Gneiss)
- bzpsl — phyllonitic metasiltstone

Middle Proterozoic

TOXAWAY GNEISS

- Ytgm — megacrystic biotite granitic gneiss
- Ytgl — layered biotite granitic gneiss

ROCKS OF UNCERTAIN AGE AND AFFINITY

- bsa — biotite schist and amphibolite

BEDROCK STRUCTURAL FEATURES

(shown in gray on 1:12,000-scale map)

CONTACTS

solid line – located to within 50 feet
long-dashed – approximately located to within 200 feet
short-dashed – inferred

lithologic contact

fault contacts
saw-teeth on upper plate

- pre- to synmetamorphic fault
- brittle fault reactivated along an earlier ductile fault with dextral strike-slip component
- ductile fault with significant dextral strike-slip component

STRIKE AND DIP OF PLANAR FEATURES

Observation sites are centered on the strike bar, or are at the intersection point of multiple symbols. Structural measurements taken specifically on, or near slope movement featuresare shown in red.

- 53 foliation(s) (foliation parallels compositional layering)
- vertical foliation(s) (foliation parallels compositional layering)
- 31 mylonitic foliation
- 56 joint
- vertical joint
- 30 mesoscale brittle fault (ball and bar on inferred down-dropped side)

BEARING AND PLUNGE OF LINEAR FEATURES

The intersection point of the strike bar and linear feature marks the observation site.

- 36 mesoscale fold axis
- 21 mineral lineation

MAP SCALE STRUCTURAL FEATURES

- axis of map-scale antiform
- axis of map-scale synform