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Description of stone-stripe excavation on Big Mountain,
Giles County, Virginia

by

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This report is preliminary and has not been reviewed for conformity with U.S. Geological Survey editorial standards and stratigraphic nomenclature.

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Introduction

Patterned sorted ground in the central Appalachians testifies to the existence of much colder past climate. Clark (1968 and personal communication, 1980) reported stone stripes and circles from several locations in Virginia, including Big Mountain in Giles County. Unfortunately, perhaps as a result of thousands of years of disturbance by tree throw, the surface expression of many of these features is less clear than might be desired (e.g., Fig. 1). In order to determine whether the subsurface appearance is somewhat more distinctive than the surface appearance (thereby increasing the confidence with which these phenomena can be considered to be periglacial relics), a stone stripe on top of Big Mountain was excavated with a backhoe.

A stone stripe was selected in a saddle of Big Mountain, just north of the jeep road along the crest of the mountain, about 2.7 km west of the intersection of the jeep road with Virginia State Route 613. At this location the latitude is $37^{\circ} 24' 13''$ N, the longitude $80^{\circ} 32' 59''$ W, and the elevation, 1143 m. The orientation of the stone stripe was 006° , and of the trench, 250° . (The trench was thus cut obliquely across the axis of the stone stripe, rather than at right angles. This was made necessary by the location of large trees.) The trench was approximately 10 m long, and was filled after the observations were completed. Soil profiles were described at four locations. These locations were measured from the east end of the trench, and are shown in Figure 2.

General Observations

A high water table made it impossible to excavate to the base of the stone stripe. Future excavation projects should hire a pump as well as a backhoe. The lateral margins of the stone stream were well exposed, however (Figs. 4, 5, and 6). Although the boundaries between the stripe and the adjacent finer residual soil are gradual or diffuse, they do define a trough-like cross-section for the boulder stripe. The stripe itself consists mainly of boulders and cobbles, with a very high organic content in the interstices; the adjacent residual soil has few clasts and a very low organic content. The organic material in the stripe probably consists of forest litter that has been washed down between the boulders, and is unlikely to be very old.

The dramatic contrast between the bouldery debris of the stripe and the relatively fine-grained nature of the adjacent soil indicates that the stone stripes are discrete, well defined features. The similarity between the trenched stripe and stripes reported from arctic regions makes it appear likely that the Big Mountain stripes are indeed periglacial relics. Dating will be required to prove this assertion, however.

Profile Descriptions

Profile 1: North wall of trench, 5 m from west end. Near center of stripe.
(See Figs. 4 and 5)

<u>Depth</u>	<u>Description</u>
0-80 cm	Cobbles and small boulders, up to 50 cm in diameter, mainly of Tuscarora Sandstone. Open voids between clasts.
80-100 cm	Cobbles and small boulders with sandy loam matrix (61 % sand, 37 % silt, 2 % clay). Matrix color 10YR 2/1.

100-160 cm Cobbles and small boulders in sandy loam matrix (54 % sand, 31 % silt, 15 % clay). Matrix color 7.5 YR 3/2. Roots penetrate to 160 cm.

160 cm Water

Comment: Note low values and chromas throughout profile, owing to high organic content.

Profile 2: South wall of trench, 5.5 m from west end. Near center of stripe. (See Fig. 3).

<u>Depth</u>	<u>Description</u>
0-35 cm	Cobbles and small boulders, sandy loam matrix (59 % sand, 31 % silt, 10 % clay). Matrix color 10 YR 3/1.
35-90 cm	Cobbles and small boulders, sandy loam matrix (56 % sand, 34 % silt, 10 % clay). Matrix color 5 Y 2/2.
90-100 cm	Boulders and cobbles, loam matrix (45 % sand, 31 % silt, 24 % clay). Matrix color 10 YR 5/4.
100-170 cm	Boulders and cobbles, clay loam matrix (30 % sand, 32 % silt, 38 % clay). Matrix color mottled (2.5 Y 5/2, 10 YR 6/2, 6.25 YR 4/6).

Comment: High organic content to depth of 90 cm.

Profile 3: North wall of trench, 8.7 m from west end. Near east margin of stripe. (See Fig. 4). Residual soil.

<u>Depth</u>	<u>Description</u>
0-18 cm	Sandy loam (53 % sand, 36 % silt, 11 % clay). Color 10 YR 3/2.
18-30 cm	Loam (51 % sand, 34 % silt, 15 % clay). Color 7.5 YR 4/4.
30-60 cm	Sandy loam (55 % sand, 30 % silt, 15 % clay). Color 10 YR 4/4.
60-100 cm	Sandy loam (72 % sand, 22 % silt, 6 % clay). Color 10 YR 5/8.
100-140+ cm	Sandy loam. Color mottled (2.5 Y 6/2, 10 YR 5/6).

Comment: Only small amount of pebbles and cobbles in the profile; no boulders. Very low organic content.

Profile 4: East end of trench. Residual soil. (See Figs. 7 and 8).

<u>Depth</u>	<u>Description</u>
0-20 cm	Loam, color 10 YR 4/6.
20-50 cm	Sandy loam, color 10 YR 4/6.
50-60 cm	Clay loam, color 10 YR 4/6.
60-150 cm	Sandy loam and sandy clay loam. Mottling, with slight textural differences associated with different colors. For samples from 110 cm, the whitish color (10 YR 8/1) was sandy loam (54 % sand, 28 % silt, 18 % clay), whereas the brownish color (7.5 YR 5/8) was sandy clay loam (50 % sand, 27 % silt, 23 % clay).

Comment: Less organic material here than in profile 3. The residual soils thus have much less organic material than does the stone stripe itself.

References Cited

Clark, G. M., 1968, Sorted patterned ground: New Appalachian localities south of the glacial border: Science, v. 161, p. 355-356.



Figure 1. Surface of stone stripe similar to one excavated.

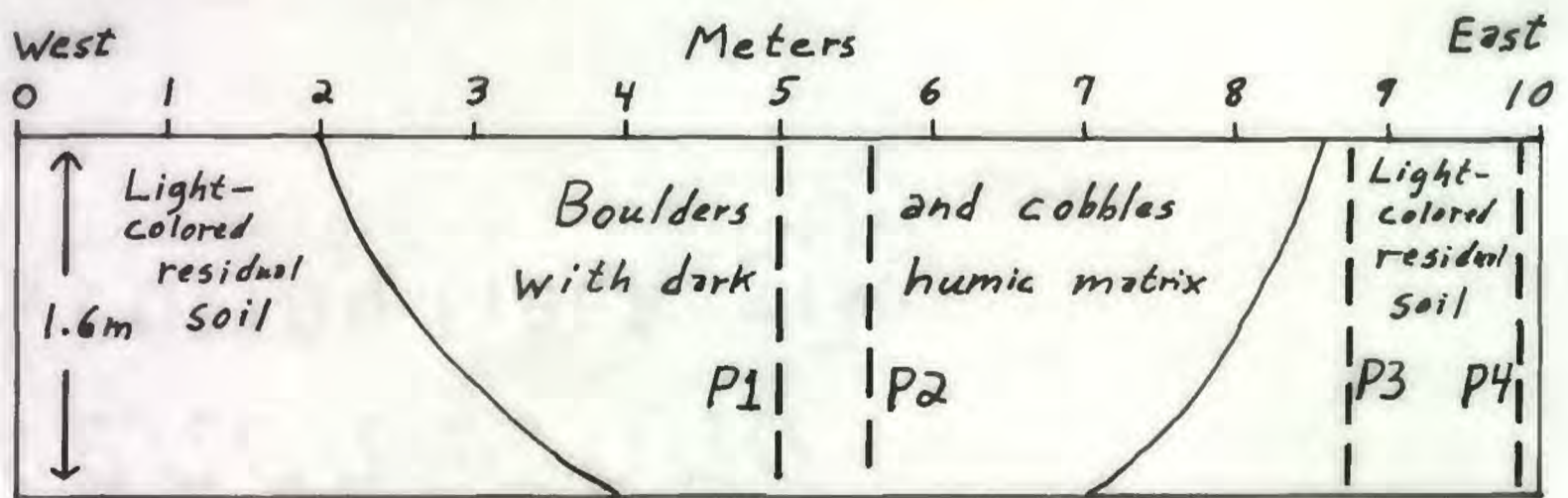


Figure 2. Sketch of cut through stone stream showing locations of described profiles.



Figure 3. Trench through stone stream, looking from east to west.



Figure 4. North wall of trench, looking toward east end.



Figure 5. North wall of trench, looking toward west end.



Figure 6. Contact between organic-rich, bouldery stone stripe (right) and oxidized residual soil (left) on north wall of trench.



Figure 7. Profile 4: Residual soil at east end of trench.



Figure 8. Profile 4: Close-up of mottling, testifying to presence of high, fluctuating water table.