**For additional reading:**


Schultz, A.P., 1986, Ancient, Giant Rockslides, Sinking Creek Mountain, southern Appalachians, and Virginia: Geology, v. 14, p. 11-14.

Schultz, A.P., 1993, Geologic map of large rock block slides at Sinking Creek Mountain, Appalachian Valley and Ridge province, Southwestern Virginia, and comparison with the Colorado Front Range: U.S. Geological Survey Miscellaneous Investigations Series Map I-2370.

Schultz, A.P., and Southworth, C.S., 1989, Large bedrock landslides of the Appalachian Valley and Ridge province of Eastern North America: Geological Society of America Special Paper 236, p. 57-74.


**Cover photograph:** *View of ancient giant landslide from Brush Mountain.*

**For more information**

Visit the USGS web site at:
http://minerals.usgs.gov/landslides.html

Visit the Forest Service web site at:
http://www.fs.fed.us/gwjnf



# The Mountain That Moved

## Geologic Wonders of the George Washington and Jefferson National Forests

No. 2 in a Series

**Blacksburg/Wythe Ranger Districts**


USGS science for a changing world

**U.S. Department of Interior**
**U.S. Geological Survey**

in cooperation with

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**Forest Service, Southern Region**

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Prehistoric, giant landslides in Montgomery and Craig Counties, Va., in the Blacksburg/Wythe Ranger Districts of the Jefferson National Forest, are the largest known landslides in eastern North America and are among the largest in the world. One of the landslides is more than 3 miles long! The ancient, giant landslides extend for more than 20 miles along the eastern slope of Sinking Creek Mountain. Enormous slabs of rock ranging from about 0.2 to more than 1.5 square miles in size broke loose and slid downslope under the influence of gravity. The movement of some slides may have been slow, but the movement of others was probably sudden and catastrophic.

These landslides are called rock-block slides and rockslides. In rock-block slides, a slab or block of bedrock moves down a slope intact. If the slab or block breaks up as it slides, it is called a rockslide.

## How were the landslides discovered?

The landslides were discovered in the 1980's during geological mapping, which showed that rock layers were displaced (fig. 1). The landslides had not been recognized before because they are so large they are not easily seen. The zone of landslides was identified by geologists who noticed a combination of unusual hills and hollows, geologic structures, and unexpected vegetation patterns. These landslide features include cliffs where the rock has broken away, isolated flat areas or benches, and isolated knobs. The benches have springs, small streams, swamps, ponds, and circular to elliptical depressions from 30 to 300 feet across—features that are rare on slopes without landslides. The unusual landforms can be seen on topographic maps and aerial photographs.

Many of the rockslides have evergreen vegetation, while slopes below the slides have deciduous (hardwood) vegetation. Also, swamps and ponds on the slides contain ferns that do not normally grow on the steep eastern slopes, which are usually too dry for these plants. These changes in vegetation reflect the disruption of soils in the landslide zone.

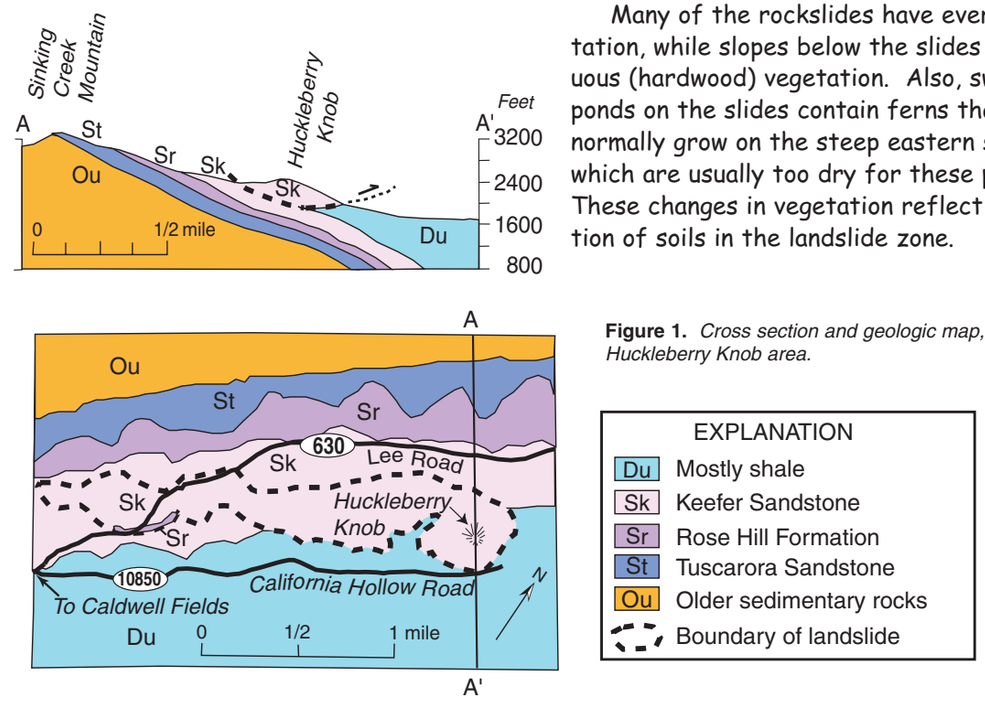


**Figure 1.** *Cross section and geologic map, Huckleberry Knob area.*

## When did the landslides happen?

The exact time of movement is uncertain, but evidence suggests that the landslide movement was between about 10,000 and 25,000 years ago. This would be during the Pleistocene Ice Age, but before the arrival of humans in the area. Pollen and organic matter from a sag pond on one of the landslides show that sediments were deposited in the pond as early as 10,000 years ago. Native American artifacts of the Woodland period (about 1,000 B.C. to A.D. 1,000) were found on landslide slopes at three places. There is no evidence of recent movement of the landslides.

## Where can you see them?

The large size of the landslides, dense vegetation, and deep erosion make them difficult to see. But, if you look carefully from certain locations, you can see the unusual landforms that are a result of these ancient landslides. They are seen best when the leaves are off the trees.

**From Caldwell Fields and Lee Road.** From the Caldwell Fields (fig. 2) parking area, look north along Lee Road (Rt. 630) (fig. 1). You will see the steep, straight "flat-irons" of

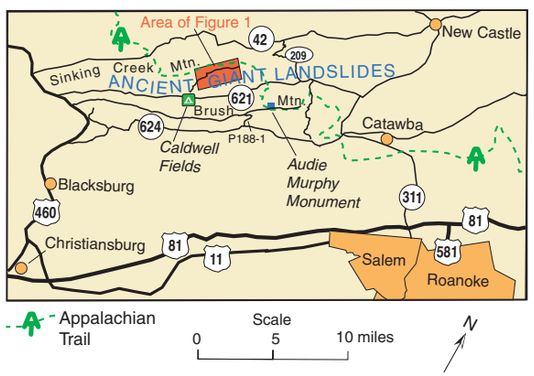


**Figure 2.** *Map showing location of ancient giant landslides.*

sandstone that are characteristic of the undisturbed parts of the east slope of Sinking Creek Mountain. Then look to your left, where the slope is broken by "lumpy" topography, and the lower bench of a large landslide can be seen below the crest of the mountain. If you look closely at the powerline at the top of the mountain, you can see a cliff where bedrock is exposed. This is the scarp from which the slab of rock in the slide broke away. If you drive up Lee Road from Caldwell Fields, you will cross one of the ancient landslides, but the changes in topography, geology, and vegetation are subtle and not readily recognized.

**Huckleberry Knob.** Huckleberry Knob (fig. 3) can be seen best when the leaves are off the trees from near the end of the Lee Road or by hiking on California Hollow Road (fig. 1). Huckleberry Knob is one of the best examples of an isolated landslide block sitting out in the valley. Notice the evergreens on the knob and the reversal in slope of the bench northwest of Huckleberry Knob. This is typical of the unusual landslide topography.

**From Rt. 621 and Hall Road.** Landslide benches can also be seen at some places from Rt. 621 on the slopes of Sinking Creek Mountain between Caldwell Fields and Rt. 209 (Hall Road). If you drive up Rt. 209, you get a good view of "lumpy" landslide ridges below the straight ridge at the skyline (fig. 4). As you continue on Hall Road to the top of Sinking Creek Mountain, you drive across an ancient giant landslide.

**From Brush Mountain.** Another viewpoint from which the landslide benches can be seen is the crest of Brush Mountain, looking north

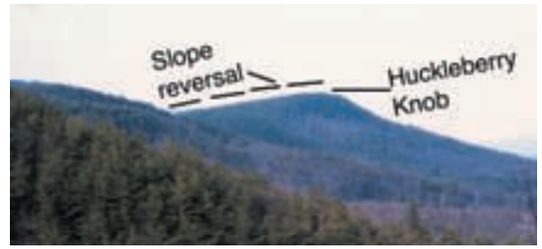


**Figure 3.** *View of Huckleberry Knob, which is an escarpment on the front of a landslide. Crest of the mountain and source of the slide are to the left.*

to Sinking Creek Mountain (cover photograph). You can drive to the crest of Brush Mountain on the gravel road (P188-1) off State Route 624.

**From the Appalachian Trail.** Hikers on the Appalachian Trail ascending from Rt. 621 to the top of Sinking Creek Mountain will walk across the benches of one of the ancient giant landslides. Along the crest of Sinking Creek Mountain, hikers can look down the eastern slope toward Huckleberry Knob and see benches on the ancient giant landslides.

## Why did the mountains move?

Erosion that undercut the base of the slope or erosion related to heavy rainfall might have produced unstable slopes that resulted in landslides. Another possibility is that the landslides were triggered by earthquakes because the landslides border on the presently active Giles County earthquake zone.

## Will there be more landslides?

Even though there is no evidence of recent movement of the ancient, giant landslides on the slope of Sinking Creek Mountain, other types of landslides (rockslides and debris flows) do occur during rainstorms on slopes in the Appalachian Mountains. In the past, most landslides occurred in uninhabited areas. Today, knowledge of the geologic setting of existing and planned development can help identify the potential for landslides. Research on how and where slope failures occur can help reduce the risk to human lives and property from landslides.

## Have the rocks been useful?

Yes. The rocks that form the high ridge of Sinking Creek Mountain are composed of sandstone (Keefer Sandstone), sandstone and quartzite (Tuscarora Sandstone), and interbedded sandstone and shale (Rose Hill Formation). Rocks from these units, both in the landslides and in the intact parts of the ridges, have long been used for building stone. Sandstone of the Rose Hill Formation commonly forms one- to two-inch thick, grayish-red to reddish-black layers that make good flagstone. The layers of the Rose Hill Formation may have provided surfaces along which overlying blocks of rock slid. (Note: If you wish to remove stone from the national forest, first stop at the Blacksburg Ranger Station and get a permit.)

**Figure 4.** *"Lumpy" ridge line (accentuated by the dashed line) formed on a landslide. View from Hall Road near Craig Creek.*