Maps of the Smokies have come a long way since the mid-1800s when Swiss geographer Arnold Guyot measured the high peaks along the Tennessee-North Carolina divide by calculating the altitude with a barometer.

Langdon's map is based on a remote sensing technology called Light Detection and Ranging that uses laser pulses transmitted from an airplane and reflected off the ground to create highly detailed, three-dimensional images of the
terrain.

To further enhance the map's realism, a computer-generated effect called "hill shading" casts shadows upon the sinkholes and hills, as if light is illuminating the landscape from the northwest.
Accompanying Langdon that day in Cades Cove was Tom Colson, the park's geographic information systems specialist, and Chris Rehak, a GIS intern for the park.

The map indicated a depression in the ground not far from the loop road. After a 20-minute walk, they located a tear-drop-shaped sinkhole in the woods. At the downslope end of the sink beneath the fallen leaves was a small hole in the ground that indicated a cave.

"With these digital maps, we're seeing the park in a whole new way," Langdon said. "Instead of relying on lines on a contour map, we're now picking up landscape features that weren't interpreted in the old aerial photography. It opens up a whole new world for those interested in exploring the park."

Langdon is among a cadre of volunteers who hike into the backcountry and take global positioning system readings to confirm the accuracy of the new laser maps.
Langdon is interested in sinkholes as indicators of caves and groundwater, as well as habitat for rare plants and animals. In the same vein, volunteers are helping the park generate detailed digital map layers for features like streams, contour lines, cemeteries and roads.

As for mountain elevations, the park's big three - Clingmans Dome, Mount Guyot and Mount LeConte - have not been officially remeasured with GPS. Park officials say the peaks they've checked so far haven't deviated much from what's indicated on U.S. Geological Survey topographic maps that used stereoscopic aerial photography.

For example, Cliff Tops, a subpeak of LeConte, has been remeasured via GPS at 6,573 feet rather than the 6,555 feet that's currently published. According to the park's GPS, Mount Hardison is 6,150 feet tall rather than 6,134 feet, and Mount Kephart stands at 6,218 feet - just 1 foot taller than is indicated on topographic maps.

"Some people are really passionate about mountains," Colson said. "They want to know within an inch how high they are.

"When you look at a map of the park, you're looking at highly varied terrain - that's what makes the Smokies a unique part of the Southern Appalachians. With the contour lines we're getting from the new LIDAR data, we can study these landforms in ways we've never been able to before."

The USGS collected the LIDAR data for the park last year using federal stimulus money. Not only will upgraded information be a big help to natural resource managers, but road and trail crews will make use of it, too.

After the digital maps are reviewed for accuracy, they will be made available to the public on an interactive website. Colson said he expects an announcement on that around the middle of next year.

"With the LIDAR mapping, we can discern a boulder that fell down Mount LeConte and rested against a stump," Colson said. "That's where the resource management application comes in. We never imagined we'd be looking for sinkholes."