Chester F. Watts (Skip), PhD, PG, M.ASCE

Dr. Skip Watts received his PhD from Purdue University in 1983. He teaches *Geology Applied to Engineering* and *Hydrogeology* at Radford University and Virginia Tech. Skip received several regional and national teaching awards, including the State Council for Higher Education's Outstanding Professor Award, Virginia's highest teaching honor, awarded by the Governor. He spent 18 months as a USGS Congressional Fellow serving Senator Joe Lieberman as a science adviser. He was named the 2003 Jahns Distinguished Lecturer speaking on the topics of *Geology and Public Policy* and *Military Operations in Difficult Terrain*. He appeared on The Weather Channel's documentary series *Storm Stories* in an episode entitled SLIDE! and as a guest on National Public Radio's Weekend Edition. Skip provides rock slope safety and stability consulting services for federal and state agencies as well as for private industry. He is presently serving as director of the Radford University GeoHazards Research Center, specializing in the use of unmanned aerial systems (UAS) for geologic mapping and investigating natural hazards of all types.

Keynote Presentation
15th Sinkhole Conference

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An Appalachian Mystery: The Hydrogeology of Mountain Lake in Giles County, Virginia. Leaky Landslide or Covered Karst?

ABSTRACT

Mountain Lake, in Giles County, Virginia was the principal filming location for the 1987 movie Dirty Dancing, at a time when the lake was full. Starting in about 2002, water levels decreased significantly during the fall months and recovered only partially during the summer months. In 2008, the lake went completely dry and then nearly so again in 2011. Mountain Lake is one of only two naturally formed lakes in Virginia. At an elevation of 3,875 feet above sea level, it is a truly unique feature in the Valley and Ridge Province within the unglaciated southern

Appalachians. A karst collapse origin for the lake has often been suggested. Recent geophysical studies suggest that the lake owes its existence, at least in part, to colluvial damming of an ancient water gap in the breached limb of a dissected plunging anticline approximately 6,000 years ago.

Major conduits are believed to form periodically within the colluvial dam allowing water and lake sediment to pipe through the debris until such time as the conduits become sufficiently clogged to again hold back nearly 100 feet of water depth. The colluvial deposits are likely never completely free of leaks, however it does appear that leakage varied in severity somewhat over the thousands of years. In 2013, the owners undertook a massive earthmoving project intended to restore the lake by filling depressions at the base of the dam, caused by the piping of lake sediment, with naturally available materials from the site. The effort was successful and water levels rose rapidly until encountering additional side conduits at higher elevations that now appear to control lake levels.

Radford University researchers have utilized dye studies, electrical resistivity, seismic refraction, side scan sonar, SCUBA, submersible ROV, unmanned aerial systems, and more to investigate the lake. Observations indicate that the leaks overall are greatly reduced and that precipitation is nearly normal for this region, raising the question of whether changes within the watershed may also play a role by decreasing the inflow side of the water budget equation. In 2002, a part of the drainage basin was modified by the development of new cottages, parking lots, and storm water retention basins. Runoff modeling using the rational method reveals that annual surface flow to the lake has decreased from that area. Groundwater modeling reveals that infiltration beneath these stormwater retention basins lies outside of the groundwater divide for the system that provides base flow recharge to the lake, hence surface water captured by the retention basins appears permanently lost to the lake.