Into the Abyss:
The Case of the Collapsing Sinkhole

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Part I—Sinkholes Near Orlando, Florida

The Orlando metropolitan area is situated in a region where sinkholes can develop unexpectedly as the land surface collapses into underground cavities (void spaces that range in size from small openings to large caverns). These cavities occur in the limestone bedrock, which is covered by 90 to 150 feet of sandy clay and an additional 30 to 60 feet of sand (see geologic cross section in Figure 1). The limestone bedrock also serves as an aquifer, called the Floridan Aquifer, for the residents of this area.

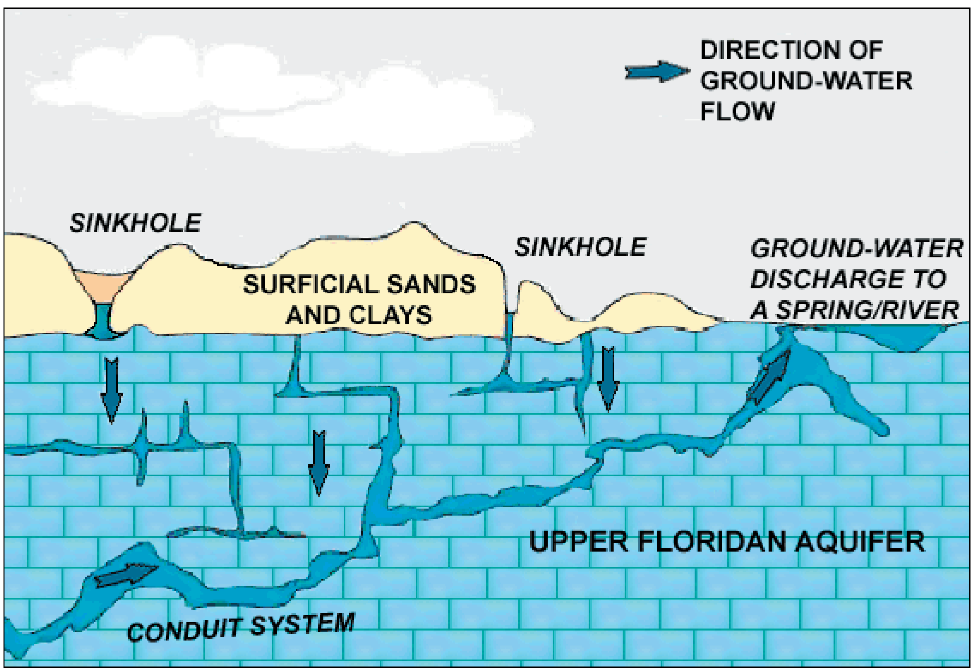

Figure 1: *Geologic cross-section showing entry points to groundwater contamination. Source: USGS. The Suwannee River Basin Pilot Study.*

At least 140 new sinkholes formed in the Orlando area (Orange and Seminole Counties) between 1961 and 1986, with an average of 11 new sinkholes appearing each year (Wilson and Beck 1992). Data from Wilson and Beck (1992) show that the appearance of new sinkholes is not equally distributed throughout the year (see Figure 2).

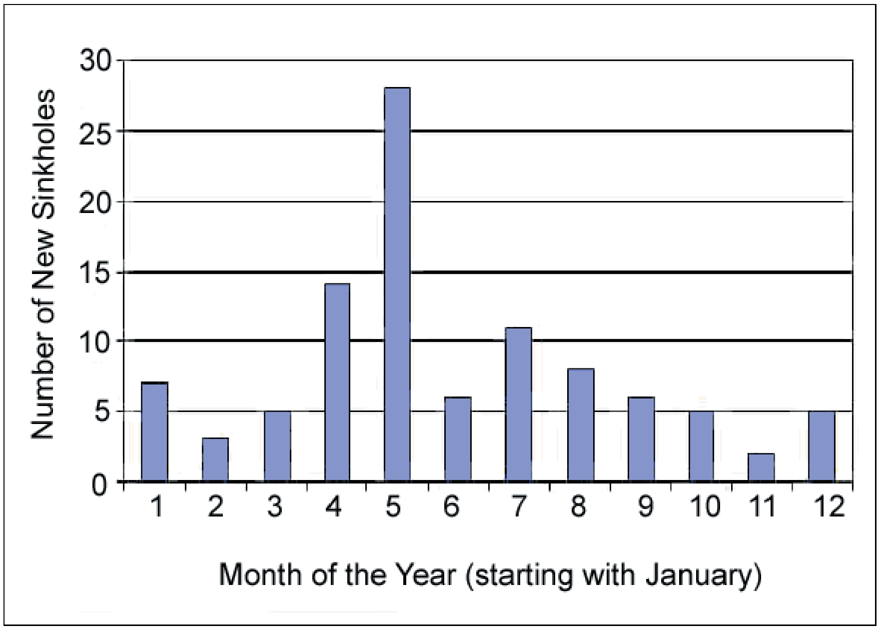

Figure 2: *Number of new sinkholes in Orange and Seminole Counties, Florida by month of the year for the years 1961 through 1986. Note that the month of the year is represented with a number, starting with January as 1 and ending with December as 12.*

Terms to Understand

Aquifer	Cavities
Collapse	Sand
Bedrock	Clay
Limestone	Sinkhole

Questions

1. During what months of the year are sinkholes most likely to form in the Orlando area?
2. What hypothesis(es) can you suggest to explain this pattern of sinkhole development?
3. What data would you need to test your hypothesis(es)?

Reference

Wilson, W.L., and B.F. Beck. 1992. Hydrogeologic Factors in Affecting New Sinkhole Development in the Orlando Area, Florida. *Ground Water* 30(6):918–930.

Part II—Mining Company Sued for Causing Sinkhole

During the spring of 1994, a man driving his minivan near Westminster, Maryland, plunged to his death in a sinkhole that suddenly opened up in the road. His widow sued a local mining company for $13.5 million, claiming that it was responsible for the development of this sinkhole.

Read the following article and answer the questions below. As is common with newspaper articles, this one does not provide all of the information we might like to have to evaluate the validity of the widow's claim. However, using the geologic information available for this region and your understanding of how sinkholes form, it is possible to at least have an informed opinion about what happened and what additional information would be needed to further evaluate this case.

SINKHOLE SUIT SEEKS MILLIONS*

The state of Maryland and Redland Genstar, Inc., are each being sued for $13.5 million by the widow of a man who was killed when his minivan plunged into a sinkhole on Maryland Route 31.

One early morning in March of 1994, Robert W. Knight, 24, was driving down a darkened stretch of pavement between Westminster and New Windsor when the road ran out. Sometime during the night a 45-foot-wide hole had developed without warning that the driver never saw until it was too late. The Taneytown native died at a hospital later that day.

Sinkholes can occur when underground limestone or marble bedrock slowly dissolves, leaving behind caves that eventually become so large that they collapse.

In her suit against the state and Genstar, based in Hunt Valley, the plaintiff claims emotional pain and suffering, loss of companionship, financial support and other losses on her part and on behalf of her two children. Her suit was filed in Carroll County Circuit Court and targets a Medford quarry situated close to the sinkhole site and belonging to Genstar.

According to the suit, Genstar failed to look into possible hazards, failed to provide the state with reports on the impact of the mining, failed to prevent sinkholes on Route 31 and failed to warn the public of possible danger. The suit further alleges that "Genstar drew off billions of gallons of water from underground streams and severely lowered the water table, leading to the development of sinkholes throughout the immediate area surrounding the quarry and the sinkhole on Route 31 in which Robert Wayne Knight lost his life."

A spokesman for Genstar denied responsibility for the accident. According to a recent state law, "spheres of influence" are drawn around quarries indicating areas in which sinkholes and other geologic activity can be attributed to mining activity. A company is liable for property damage within these spheres if it is caused by its mining activity. However, Genstar claims that the area where the sinkhole occurred on Route 31 lies outside the company's jurisdiction.

*Based on an original 1996 AP article, "Mining firm sued for $13.5 million, WESTMINSTER, Md."

Questions

1. Westminster is situated near the center of Carroll County in east central Maryland. Are geologic conditions in this part of the state appropriate for sinkhole development? To answer this question, refer to the two maps below. What other information might you want to answer this question more fully?
   - **Map I—Generalized Geologic Map of Maryland (1968)**
   - **Map II—Distribution of Caves in the U.S.**
2. What is the widow of Robert W. Knight basing her suit on? What evidence would she need to prove her case?

References

Davies, W.E., and I. M. Morgan, The Geology of Caves; U.S. Geological Survey and the National Park Service; **http://wrgis.wr.usgs.gov/docs/parks/cave/cave.html**

“Mining firm sued for $13.5 million, WESTMINSTER, Md.” by The Associated Press, 1996.

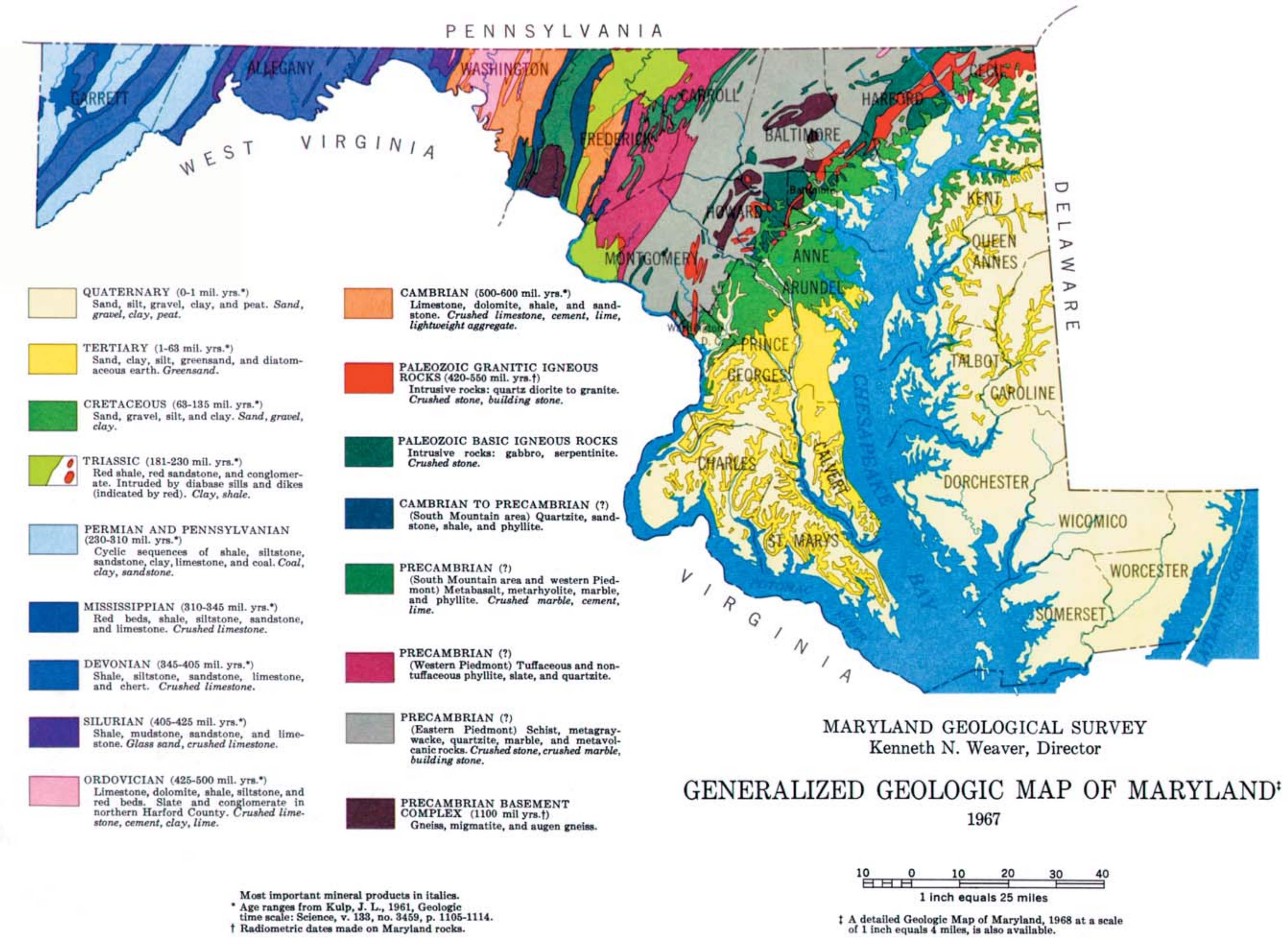

Image Credit: Map courtesy of the Maryland Geological Survey **http://www.mgs.md.gov/**.

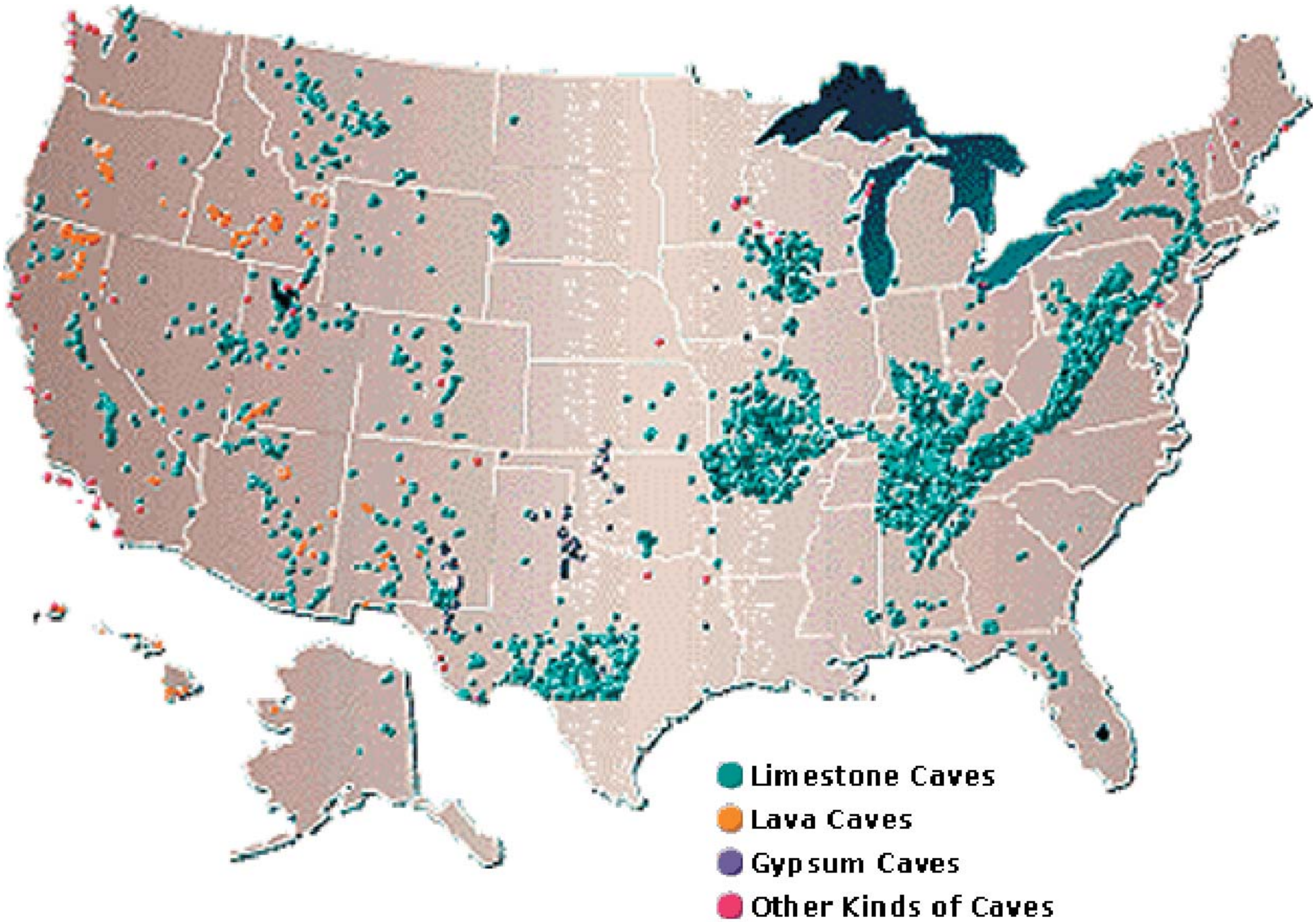

Image Credit: Map courtesy of U.S. Geological Survey, “Exploring Caves,” http://interactive2.usgs.gov/learningweb/teachers/explorecaves.htm.