

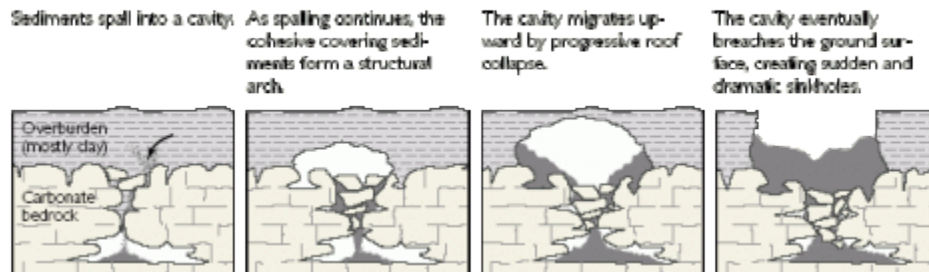
SINKHOLES – WHERE AND WHY THEY FORM

In the wake of the sinkhole that developed beneath a Florida man's bedroom, tragically killing the man as he was "sucked" into the earth, many people are searching for information. While I am unable to tell you all the details of this event, I can give you some information about sinkholes: where and why they can form, and what the average person can do to avoid the same fate as Jeff Bush.

Sinkholes are actually a pretty common thing, and although the frequency of their occurrence varies, they can happen in nearly every state. As I mentioned in my previous post about sinkholes (and how the media often confuses them with landslides), sinkholes are the result of some open cavity beneath the surface. These void spaces can form in a couple major ways, but are almost always a result of geology.

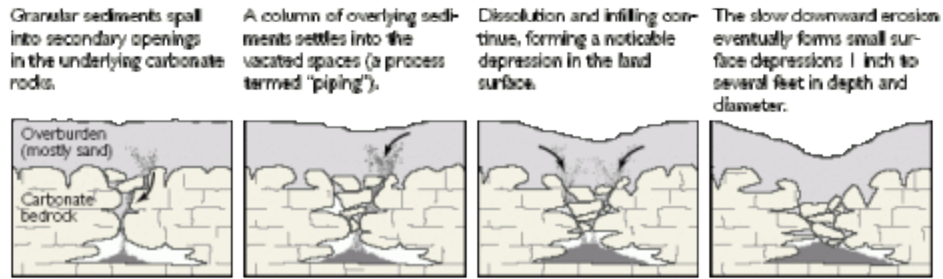
First is what we call a solution cavity. In other words, the rock is comprised of a material that can be dissolved by water over time. Rock types prone to dissolution include carbonate and evaporites; Limestone and gypsum are common examples of these. The term *karst* is used to describe the process and features as a result of dissolution.

Over time, as the solution cavity grows larger, the “ceiling” of the cavity begins to collapse due to the lack of support. This cycle continues for a while – the cavity grows through dissolution, the ceiling collapses under its own weight – until finally, the ceiling is at the ground surface...and collapses. If you have a large enough cavity, the entire overburden falls into the cavity and you are left with a large hole, like a cave with a skylight (the Guatemala Sinkhole is a prime example). This is termed a *cover-collapse* sinkhole.



Progression diagram of a Cover-Collapse Sinkhole (USGS)

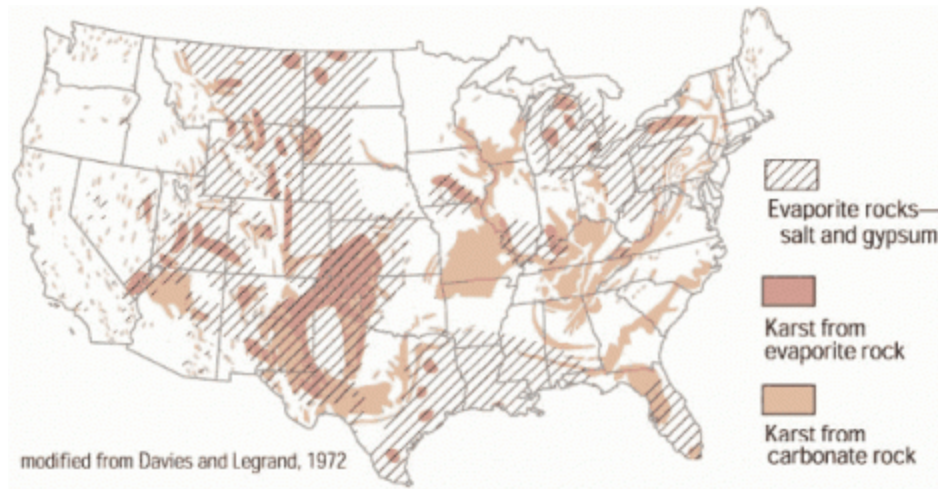
Just as often (or perhaps even more often), the overlying material continuously fills the cavity as it forms. Instead of a hole, you are left with a bowl-shaped depression at the surface. Unlike the cover-collapse version, where you'd never know anything is happening until it reaches the surface, this type of sinkhole happens more gradually, with the surface depression growing over time. This is called a *cover-subsidence sinkhole* due to the subsiding nature of the ground surface.



Progression diagram of a Cover-Subsidence Sinkhole (USGS)

Another major cause of sinkholes is man-made cavities. Abandoned mines can cause either type of sinkhole, but because the cavity is due to excavation of rock, it can be in any rock type. As long as the ceiling is unsupported or the above material begins to collapse into the mine, no dissolution process is required. However, this tends to be not as common as you'd think, especially with newer mines. Even more important to point out, is mining technology is at a point where, often times, an abandoned mine is not left open only to later collapse, it's actually collapsed in a controlled environment where the subsidence at the surface is minimized and, once complete, will not continue in the future.

In any case, there are maps available to help you learn if you or your home are at risk of this natural, destructive phenomenon! Here is the USGS's map of the contiguous United States, which shows the general regions with karst, where sinkholes are most likely to occur.



Map showing karst-prone areas in contiguous United States (USGS)

Your state's Geological Survey can supply more detailed maps of karst areas, abandoned mine occurrences and more. Here's a link to the Florida Geological Survey's Sinkhole type, Development and Distribution in Florida Map, for those interested.

Don't fret! Even if you live in one of these areas, you're most likely not in harm's way. In fact, deaths and even injury due to sinkholes are incredibly rare. Property damage rates, however, are not so lucky. This is why it's important for you to check detailed maps before (or even after) buying a home to see if sinkholes (or other geo-hazards such as landslides or flooding!) have occurred in the area. This can also help you make a decision on buying insurance for such events.

So what happened that caused a sinkhole to form below Jeff Bush's house last Thursday? My educated guess, based on the limited information I have read from several news reports, is that this was a cover-collapse type sinkhole. I say this because a cover-subsidence sinkhole most likely would have caused structural damage to the house long before the room collapse, as the ground beneath the house slowly sank, in the process becoming a known hazard. Therefore, it most likely happened all at once. The fact that Mr. Bush's body was never found leads me to feel more confident in this guess (and very sad for the family), as this implies a deep sinkhole where the ground collapsed into it, versus a large depression.

The cause of the sinkhole could have been simply a natural occurrence of karst (known to be common in this area), or "fueled" by a leaking water pipe beneath the house and resulted in the dissolution cavity forming at that location. That's pure speculation on my part, though.

Source: <http://adventuresingeology.com/2013/03/04/sinkholes-where-and-why-they-form/>