What You Should Know About

SINKHOLES

A Prepper's Report

MIKE WALLACE

What You Should Know About Sinkholes: A Prepper's Report

By Mike Wallace

Pictured on the cover, the Ravenna Boulevard Sinkhole, Seattle, 1957

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Sinkholes: A Growing Problem?

The sinkhole that swallowed a sleeping Jeff Bush on February 28, 2013, though a sudden and random event, was not without precedent. The area of Florida near Tampa, where the house Bush died under was located, is known as Sinkhole Alley for a reason. The lakes, ponds, and swamps that make Florida so popular among sunshine seekers, retirees, birders, and other residents or tourists are really sinkholes that filled with water—places where surface and groundwater converge.

More than a hundred sinkholes open up in Florida alone each year, leading to a new specialty in the practice of Florida law: "sinkhole separations." Lawyers specializing in such litigation address the sinkhole-related claims of plaintiffs against either insurance or former property owners who falsely claimed that no sinkhole damage existed at the property.

Florida is not alone in sinkhole emergence. In northern Alabama, many areas of the state are undergirded by limestone or other carbonate rocks, making them particularly vulnerable to the formation of sinkholes. Morgan County, Alabama, is home to "Newsome Sinks," a 4-mile stretch of land peppered with ravines, rocks, ridges, cliffs, creeks—and yes, sinkholes. The area, which was discovered (and named after) blacksmith and woodworker William Newsome, hasn't reached the national news because no one has been "swallowed up" there. But the residents of that area certainly do know what a sinkhole is.

Sinkholes have caused fatalities or other mayhem in numerous other states as well. Oklahoma, North Carolina, Texas, New York, California, Colorado, Maryland, Washington (state), and Wisconsin are just a few of the states where at least one significant sinkhole as emerged within the last century—and in some cases, many more.

Alabama's Newsome Sinks, and similar areas in the South, are particularly vulnerable because many of them sit atop limestone. The land supported by the limestone, which is known as karst, appears to be fine on the surface—for a while. But circulating groundwater erodes or dissolves the foundation under the karst. When the support for the karst is gone, the land suddenly collapses and a sinkhole is formed.

Sinkholes may also result from human activity. The collapse of old mines, water mains, or sewage pipes have all been responsible for sinkholes. Excessive extraction of underground water can also result in sinkholes by altering the natural drainage patterns for the area. Construction-related changes to land surfaces may also result in underground collapses, once again leading to sinkholes.

The heavy rainfall in Florida, which results in vast channels of subterranean groundwater, is a contributing factor in that state. Because the Sunshine State's bedrock is soft, that bedrock can start to erode when wells are dug. When Floridians pump underground water supplies for drinking, lay leaky pipes under the soil, or pump away groundwater to protect their valuable strawberry crops, they effectively destabilize the hidden caverns beneath them.

Are Sinkholes Increasing in Frequency?

It's hard to say at this point whether sinkholes are increasing in frequency. As opposed to hurricanes or earthquakes (which are more widespread events) sinkholes are more localized. Because a lot of karst area is also farmland, sinkholes happen all the time in agricultural settings. Many of them are

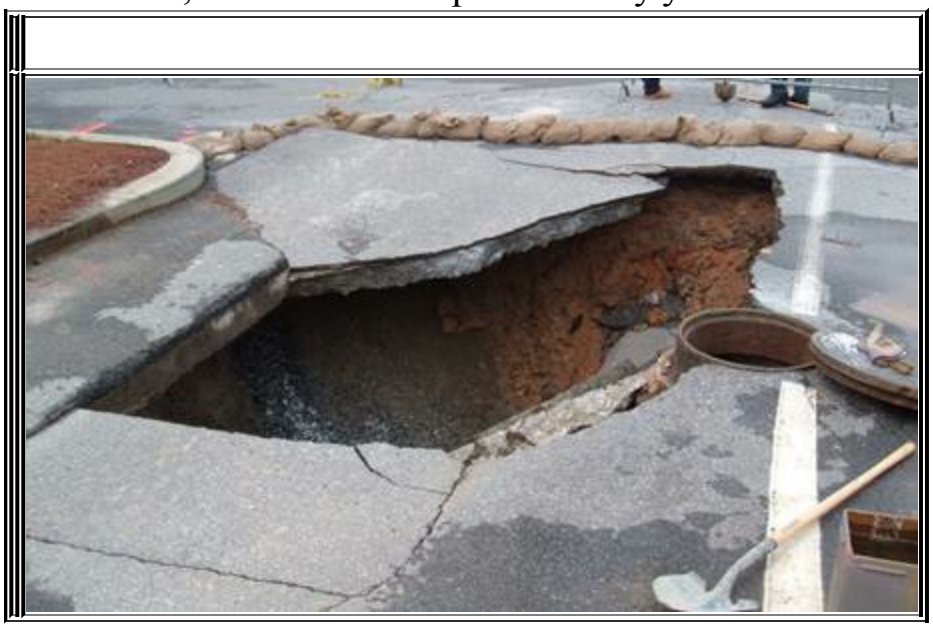
small or resulted in no injury, so we just don't hear about them.

Because at present there is no worldwide database of sinkhole activity, it is hard to say if the number or size of sinkholes is truly increasing. What can be said, however, is that human intervention in the environment (e.g. excessive irrigation or pumping of subterranean water supplies) is likely increasing the probability of sinkholes, and the number of humans who will be impacted by them.

Sinkholes Explained

Imagine that you are driving along the highway, and suddenly on the right side of the road you see an entire gas station disappear into the ground. The only natural phenomenon that has this kind of power is a sinkhole. A sinkhole is a hole in the earth that occurs because the foundation underneath is weakened by water and eventually it collapses. Although sinkholes have always existed, in recent years they have achieved increasing notoriety. Due to human intervention in the environment, they may also be emerging with ever-increasing frequency.

Sinkholes commonly occur in areas with karst—a geological formation formed by dissolving layers of bedrock. A common kind of bedrock in Florida and Kentucky is limestone. Because of the karst in these states, sinkholes are reported every year.



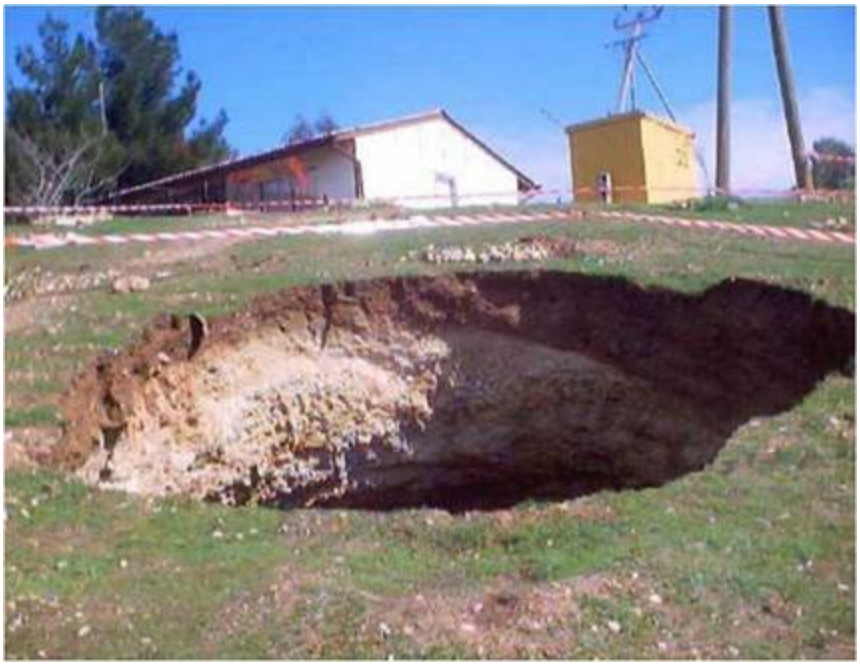
There are three different kinds of sinkholes; cover collapse sinkholes, solution sinkholes, and cover subsidence sinkholes. Cover collapse sinkholes are the most common kind of sinkhole to occur in Florida. It is also the most dangerous kind of sinkhole—they happen when an underground caverns roof is weakened and eventually gives away. Solution sinkholes occur when limestone is exposed at the surface. It can most easily be identified by depressions in the ground and shallow holes as well. Cover subsidence sinkholes appear when limestone dissolves and the cover material moves downwards to replace it. These sinkholes are usually only 2-3 feet in diameter and length.

Sinkholes can also emerge due to unnatural causes. In 2010, there was a cold spell in January. As a result, Florida farmers pumped billions of gallons of water onto their strawberries to keep them from freezing. Within days, dozens of sinkholes appeared all over the county where the pumping took place. During the pumping of water, the local aquifer had dropped by 60 feet, and then it went back up by 50 feet. This sudden change caused numerous cover collapse sinkholes to happen. About a dozen homeowners lost their houses because of sinkholes. Many other wells were damaged. Other human activities that can lead to sinkholes taking place are water main breaks and collapsing sewers.

Sinkhole Susceptible Regions

The states where sinkholes collapse most frequently include Florida, Texas, Alabama, Missouri, Kentucky, Tennessee, and Pennsylvania. These states contain geological formations that enable disastrous sinkholes to happen. Underground cavities are common where salt, gypsum, dolomite, and limestone rocks are prevalent. While these rocks are found in more than 1/3 of the United States, they are usually buried at great depths. In the states west of Oklahoma, gypsum (another soluble rock) is common and can also dissolve rapidly under torrents of rain. Salt domes, which are also relatively common in some of the Western states, can also collapse into sinkholes.

The entire state of Florida can be classified as karst, making it particularly vulnerable. Other limestone terrain on the Eastern seaboard would include an area stretching from eastern New York all the way south through Tennessee and into Alabama. Indiana, Missouri Ozarks, and portions of Minnesota are also at risk.



Sinkhole Warning Signs

Here are fourteen warning signs that you should watch for if you think your house is in an area that might be susceptible to sinkholes.

1. Cracks begin to form in a stairway or foundation
2. A circular area of the ground begins to crack, showing where the sinkhole is
3. The well water becomes cloudy from sediment
4. Windows and doors no longer close
5. You find cracks in the outside wall of your house
6. There are cracks in the inside of the house along the joints, doors, and windows
7. The driveway and sidewalks began to get large cracks
8. Your floor begins to slope in an uneven fashion
9. There are depressions in the ground in your yard or your neighbor's yard
10. Water begins to collect in small amounts in small ponds
11. Fence posts and trees that begin to slump and sink
12. The vegetation of your yard begins to wilt
13. High water bills
14. Plumbing problems

Sinkhole FAQ

My yard is settling…does that mean there is a sinkhole in it?

That's certainly possible. However, a number of non-sinkhole related factors may be responsible for the depression in your lawn. Sometimes a depression forms because soil was not tightly-compacted during excavation work. In addition, the ground may shrink due to underground organic material such as garbage or logs. Broken underground pipes can also cause a sinkhole-like depression to appear.

I am quite certain that this is a sinkhole in my yard. What should I do?

If the hole is small, fill it with clean soil or sand. If the hole is near a building or swimming pool, block off the area and have it assessed by your insurance company. If your home is directly impacted (e.g. the walls are cracking, sagging, or sinking), do not go in the home until professionals can evaluate the situation. If you need to evacuate, you may receive help from local authorities or government agencies.

If the sinkhole is on a large property and is not impacting a house, pool, or any other activity on the property, you can leave it alone. To avoid the danger of animals or people falling into the hole, you should fill it (if it isn't too large), or fence off the area. Be careful not to use organic material or anything that could potentially decompose, release toxins, or otherwise upset the ecological balance of the groundwater underneath.

In many cases, sinkholes are part of the natural landscape of a property. If a sinkhole suddenly appears, filling it with a clay-like soil will slow down the movement of water (water movement may cause expansion and/or more activity). Do not throw anything into the sinkhole that might contaminate groundwater.

How long does it take for a sinkhole to quit enlarging?

Although the collapse of a sinkhole can be sudden, the circular hole that results will likely grow for minutes or even hours. Erosion on the edge may continue for a few days. In the event of heavy rainfall, stabilization could take even longer. Settling of the area surrounding a sinkhole could actually continue for longer periods, e.g. years.

How should a sinkhole be filled in?

Anything you put underground will potentially affect the groundwater beneath. As a result, what a sinkhole is filled with (if indeed that seems like the best strategy) is very important. Limestone and claylike sand are often used. Sometimes a concrete plug is placed at the bottom. Sand and topsoil, for landscaping, are generally placed on the topmost layer. Additional fill could be required, but most sinkholes eventually do stabilize. If your sinkhole is large or you don't feel certain, seek professional engineering advice.

A sinkhole just appeared in front of my house. What should I do?

In order to protect passing vehicles from injury, block off the area and mark it immediately. Law enforcement should also be called immediately. You should also call your city or county road department to report the need for repair. If the road is not public, it will be the landowner's responsibility to repair the damage.

My neighbor just found a sinkhole in his/her yard. Should I be worried?

It would be a good idea to inspect your property for soft or sinking areas. If the sinkhole on the neighbor's property is large or borders your property, you have plenty of reason to be concerned. If the hole appears to be small or isolated, it will still be worthwhile to keep an eye on things.

Will running my lawn sprinkler make the water table level lower and trigger more sinkholes?

One person watering their lawn is not usually enough to trigger a sinkhole. Much more likely causes would include heavy groundwater pumping, rainfall, or ground loading. Drought and construction can also contribute to sinkhole development.

Is there a government agency responsible for repairing sinkholes?

No. Property insurance may cover the damages, but sinkholes on private property are the responsibility of the property owner.

Can a home inspector determine if there is a sinkhole on a property or the probability of a sinkhole?

If the inspector is a licensed and trained geologist, he or she might be able to determine the presence of a sinkhole. Trouble arises when new construction begins on property where a sinkhole has not yet developed. When the sinkhole emerges later, it damages the property. Although the potential for sinkhole development can be assessed using some forms of geological testing, such analysis is costly. In addition, even though an area may be determined to be at risk, it cannot be predicted when a sinkhole might develop. Large rainfalls, drought conditions, or changes to the underground water level—which are some of the prime factors that cause sinkholes to occur—are generally not very predictable.

Does filling a sinkhole require a permit?

If in doubt, check with local authorities. Special consideration should be given to sinkholes affecting wetlands, or where filling may result in pollution of drinking water supplies. If you do fill a sinkhole, absolutely do not use chemicals, trash, or other potential contaminants as fill. Clay-like sand and limestone rock are generally the best materials for filling a sinkhole.

How risky is my particular geographic location for sinkholes?

It is difficult to predict where sinkholes will occur. Without ground-penetrating radar surveys, which are very expensive, the underground cavities that eventually collapse into sinkholes are very difficult to detect. While some initiatives are started which attempt to catalogue known sinkholes and other local geological conditions, these are generally available to insurers for a fee, rather than the general public. As mentioned in this report, some areas of the country are certainly more susceptible to sinkholes than others. Several different types of tests can be performed to attempt to locate the cavities that might collapse into sinkholes. In addition to radar surveys, borings and electrical resistivity tests are also available. Although the expense of such testing is generally more than the average homeowner's budget, perhaps that will change in the future.

The home I am buying had a sinkhole under the foundation. It was repaired, but how can I know if the home is safe?

Across the nation, sinkholes are routinely repairs by engineering firms. If the solution to the sinkhole has been certified by an engineer and approved by the insurer, it is likely to be safe. In reality, however, there is no guarantee that a repaired sinkhole will not cause problems in the years to come.

Is there any section of Florida where there is no possibility of a sinkhole?

Not really. Since the whole state is undergirded by carbonate rocks, erosion could cause holes to form anywhere. With this said, there are definitely regions of the state where the risk of sinkholes is higher. Areas with limestone either close to the surface, or where subterranean water movement is affecting the underground limestone, are the most vulnerable.

Is there a database showing where sinkholes are in the United States?

The state geological surveys generally maintain a database of sinkholes that are reported. However, many sinkholes occur in isolated or wilderness areas such as forests and fields, where they are not seen or reported.

When I buy or sell a house, is there a law that applies with regard to sinkhole disclosure?

Check the applicable laws in your state.

Aren't all new construction sites tested for sinkholes?

Generally not. Sinkhole assessment isn't required by the building code in most states.

Can my insurance deny me coverage if a sinkhole appears in my neighborhood?

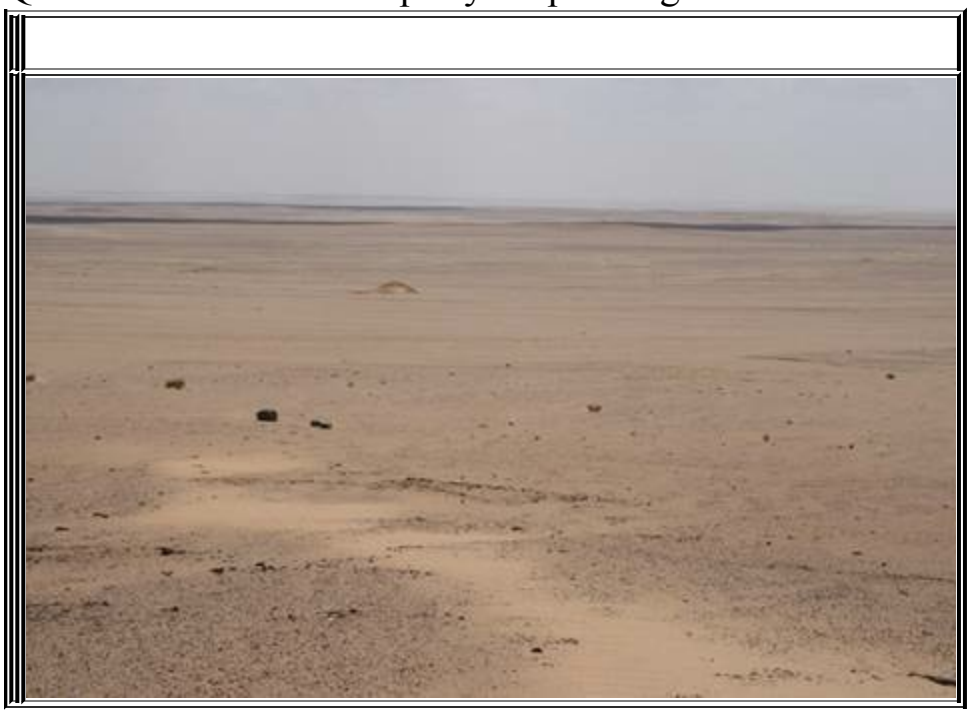
Once again, check your local laws. However, it is quite possible that they can. Some companies have more liberal policies than others, so it would be a good idea to shop around if your insurance company refused coverage based on a sinkhole issue.

Three of the World's Famous Sinkholes

1. Qattara Depression

The Qattara Depression is the biggest sinkhole in the whole world, measuring at 50 miles long and 75 miles wide. The giant pit looks unearthly and has a shocking appearance. Currently it is the focus of a $360 million project by scientists that would attempt to use the sinkholes for hydroelectric power. The sinkhole is home to a large gazelle and cheetah population, as well as a few nomadic Egyptian tribes.

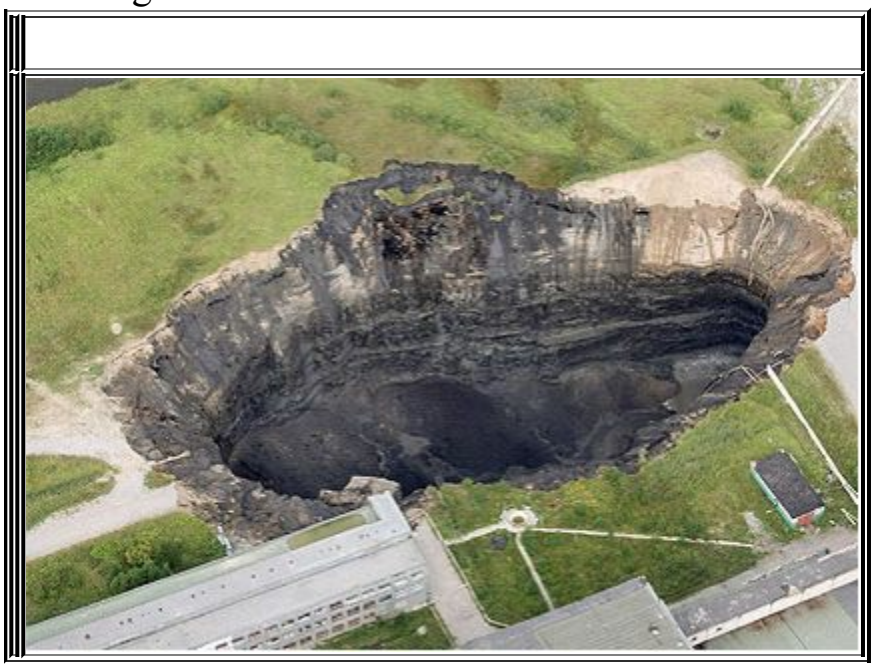
The giant natural sinkhole is called by some people a vanish land. It is indeed a natural phenomenon —scientists do not fully understand how it works. Many scientists hope to funnel water from the Qattara sinkhole to the rapidly evaporating Mediterranean Sea.



The depression has a fascinating history. Because its soft dirt made it impossible for motor vehicles to drive through, the British forces used the area as the southern defensive support during El Alamein, which was one of the biggest battles of World War II. The battle stopped the German forces from advancing into Egypt.

2. The Berezniki Sinkhole

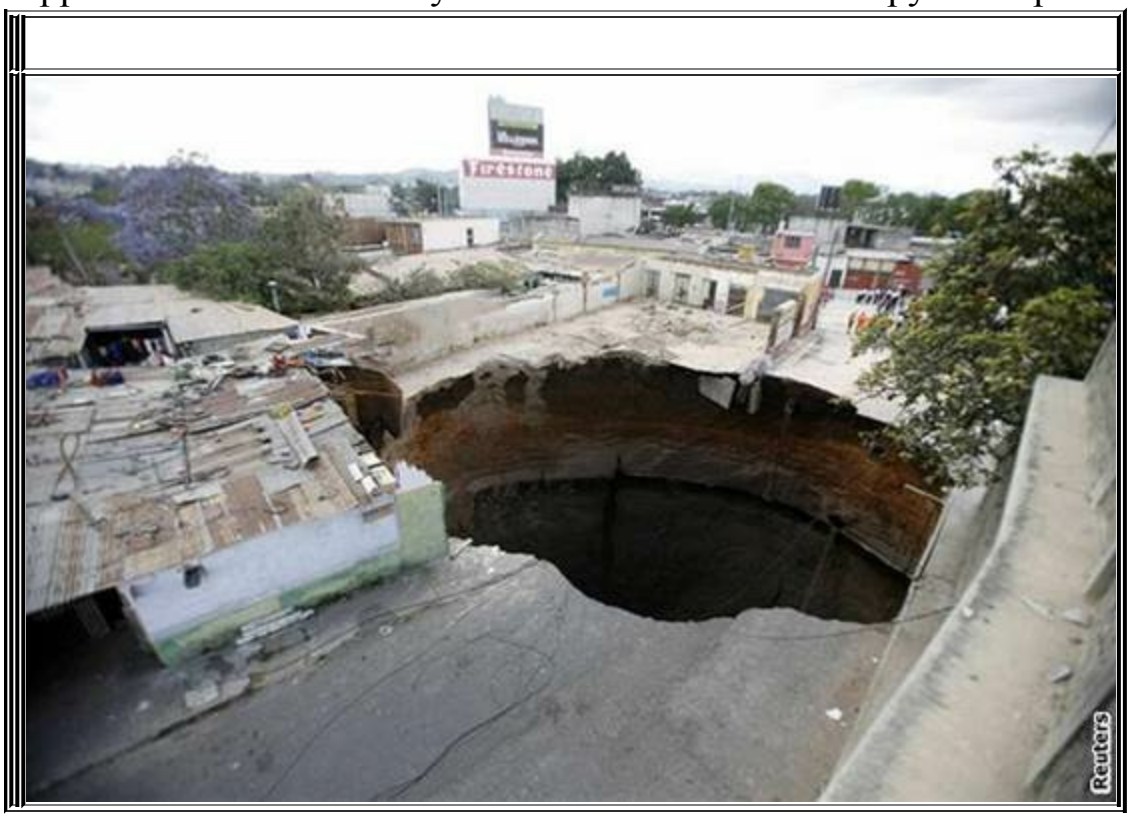
In the United States, mines have to dig far away from civilized areas due to the threat of sinkholes and other dangers. In Russia, a city was built right over a sinkhole. Because of this oversight, they have people watching 24/7 for new sinkholes. A few large ones have formed within the last few years, including one which is known as the Berezniki Sinkhole



Luckily for the town of Berezniki, the sinkhole stopped expanding just in time. It was dangerously close to sucking in a nearby railroad line which was vital to the mine's shipments of potash.

3. Guatemala City Sinkhole

In 2007, a giant sinkhole occurred in the middle of Guatemala City. The hole engulfed a three-story building and over 1,000 people had to be rescued. Miraculously, only two people died. A ruptured sewer line was blamed for the disaster. Apparently the leaking fluids had saturated and weakened the nearby soils, until the collapse occurred. The sinkhole is over 300 feet deep. In 2010 another sinkhole happened in Guatemala City that was almost an exact copy of the previous one.



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