Learning Objectives:

- I can identify the different ways caves and sinkholes are formed

Bellringer Review:

- What are some ways to improve water quality or decrease water use?

Check for Understanding Questions:

- What are the 3 ways caves and sinkholes are formed?

Sinkhole: a cavity in the ground, especially in limestone bedrock, caused by water erosion and providing a route for surface water to disappear underground.

NATURAL

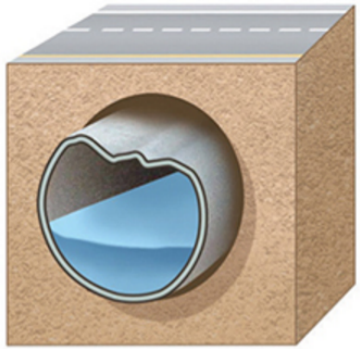
1. Water percolating into bedrock near ground level slowly erodes soluble rock such as limestone or dolomite, creating small cavities.

2. The soil on top of the bedrock, known as overburden, is composed largely of sand, silt or clay. In a process called suffosion, it starts to fall into cavities in the bedrock.

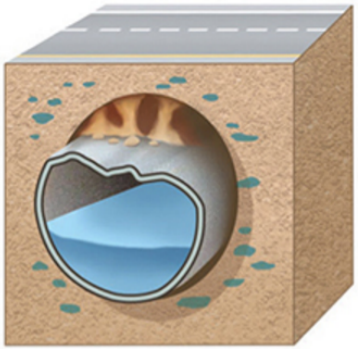
3. As this soil fills spaces in the bedrock below, a new cavity forms in the overburden, expanding toward the surface.

4. In weak soil, the cavity grows quickly in the shape of a funnel. In stiffer soil, such as clay, the cavity eventually becomes so large that the remaining overburden can no longer support itself or the weight of objects on the ground above it, and the overburden collapses, creating a sinkhole.

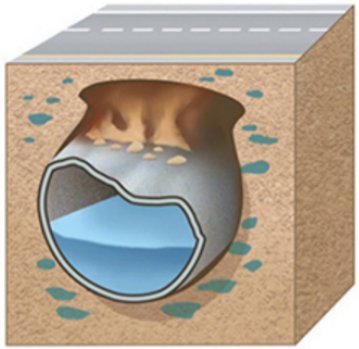
HUMAN-MADE



1. Infrastructure such as sewer pipes or water mains, located below loose deposits of earth, collapse as a result of erosion or age.



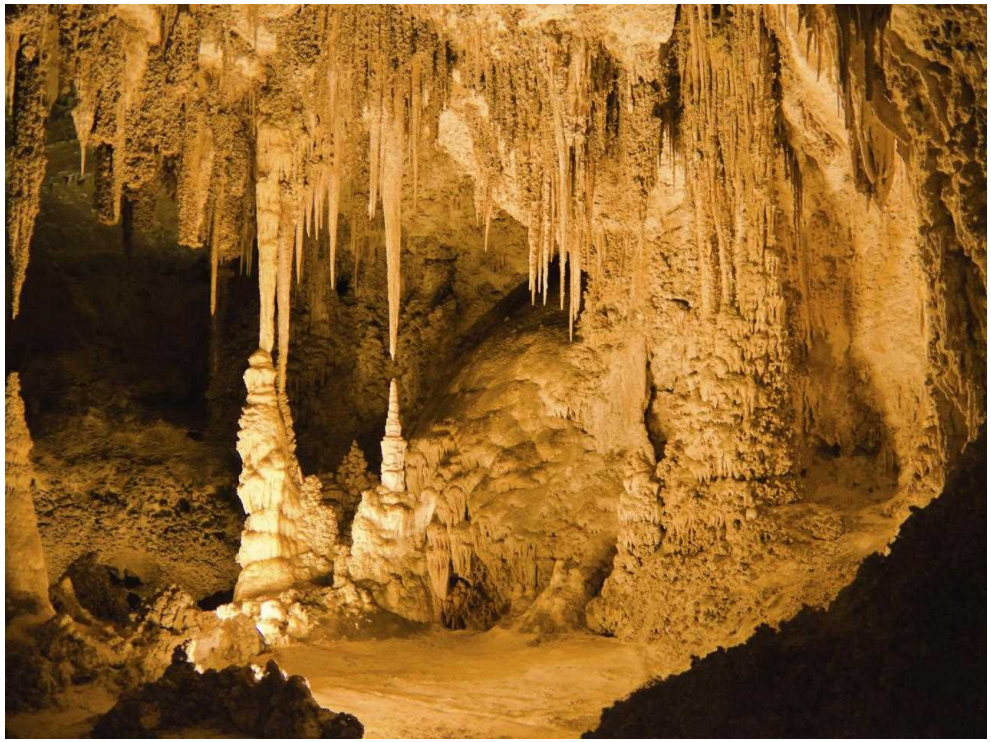
2. The loose earth fills the space created by the collapsed pipe and, in some cases, water from the pipe permeates the ground around it, weakening the surrounding soil.



3. A cavity remains above the collapse, and expands upward to the surface.

4. If sediments are very loose, a funnel-shaped sinkhole can occur quickly. But if there is a solid layer of material such as asphalt or concrete on the surface, the cavity below can remain concealed even as it grows. Once the weight becomes too much to bear, the cover collapses, and a more dangerous cylindrical sinkhole is formed.

Caves: a large underground chamber, typically of natural origin, in a hillside or cliff.

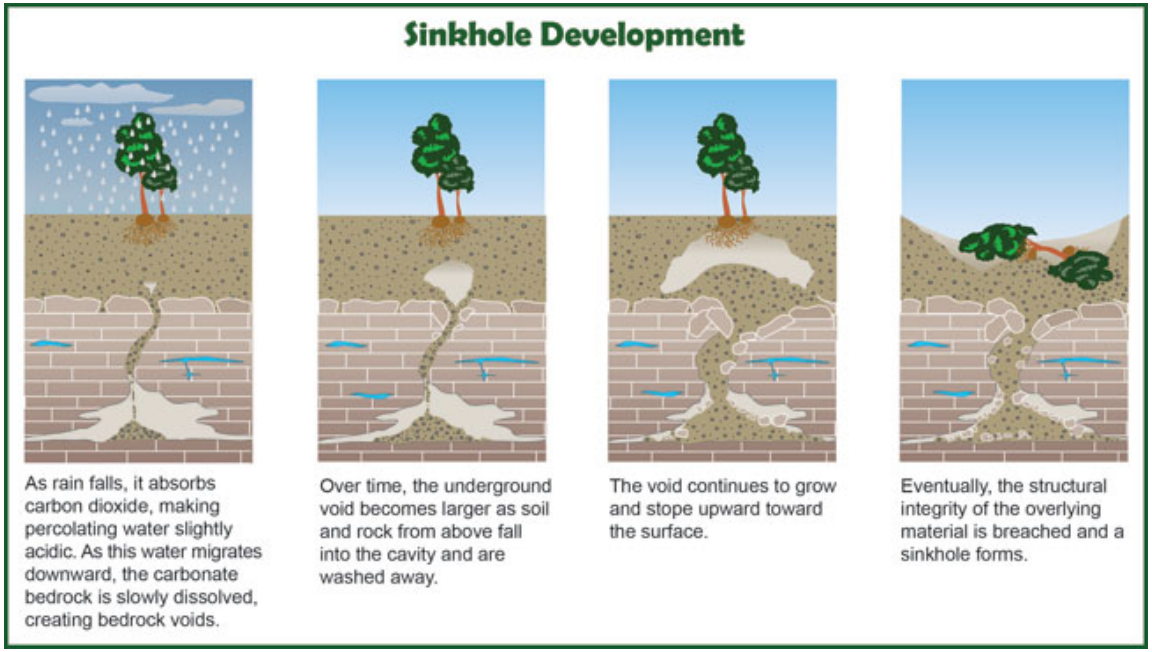


These are the 3 ways caves form:

1. Dissolution
2. Erosion
3. Gravitational breakdown (collapse)

Dissolution:

- A chemical reaction in which a solid material is dispersed as ions in a liquid.



> **Example**: Halite (NaCl) undergoes dissolution when placed in water. Or carbon dioxide dissolving limestone rich with carbonates.

Check for Understanding Questions:

- What are the 3 ways caves and sinkholes are formed?

Learning Objectives: Did you accomplish them?

- I can identify the different ways caves and sinkholes are formed.

Self-Evaluation

- How well did you understand the material today?
  (1-Lost, 2- understand, 3-can teach it)
- How well did you and your team members participate in class?
  (1-didn't do anything, 2-Bare minimum, 3-fully participated)