



Missouri

Target Audience – Subject Area, Grade 7

Time required – 15minutes

Activity Explore the cause of land features such as springs, caves, and sinkholes.

C3 Standards **MS-ESS2-2.** Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales

Learning Outcomes

- Students will make observations of the location, amount, and distribution of Missouri springs, caves, and sinkholes.
- Using a map of the major rock areas in Missouri, students will determine a cause of the land features.

Engage

Where in Missouri are sinkholes and springs located?

- Click the link above to launch the map
- When the map opens, there is a map of Missouri with its counties outlined.
 - ? What observations do you make of the map (The green areas show forest land, blue lines show rivers)
- Click on <Karst> which will open the group.
- Click on the check box <Springs>
 - ? What comes up? (Location markers for all the springs in Missouri)
 - ? What do you notice about the location of the springs (There are more springs in the southern part of Missouri and some clusters around St. Louis and Columbia. Northern Missouri has a few springs. The springs seem to be located where land is more forested.)
- Uncheck the <Springs> and click on <Sinkholes> . Make certain the <Sinkhole Points> box is checked.
 - ? What comes up? (Location markers for all known sinkholes in Missouri)
 - ? What do you notice about the location of the sinkholes? (There is a definite cluster of sinkholes in southern Missouri and around St. Louis. Some are found in the mid-Missouri area. Sinkholes seem to follow up the Mississippi River.)

Explore

What counties in Missouri have more springs, and sinkholes?

- Uncheck the <Karst> box but leave the <Missouri Counties> box checked
- Click the <Aggregation of Missouri Springs Springs to Missouri Counties County> box
- Hover over <Aggregation of Missouri Springs Springs to Missouri Counties County> . A list of options should appear, click on the first option for a Legend.
 - ? What do the larger dots mean? (There are more springs in that county)
 - ? Describe where are most springs in Missouri located? (There is a diagonal swath from the Joplin area to St. Louis which on average has more springs.)
- Uncheck the <Aggregation of Missouri Springs Springs to Missouri Counties County> box and click on <Aggregation of Karst Sinkhole Points to Missouri Counties County>
- Hover over <Aggregation of Karst Sinkhole Points to Missouri Counties County>. A list of options should appear, click on the first option for a Legend.
 - ? What do the larger dots mean? (There are more Karst Sinkholes in that county)
 - Describe where are most sinkholes in Missouri located? (There is a diagonal swath from the Joplin area to St. Louis which on average has more sinkholes. Additionally, there seems to be more sinkholes along the Mississippi River.)
 - ?

Explain

What causes areas of Missouri to have more springs and sinkholes?

- Uncheck all boxes except for <Missouri Counties>.
 - Springs, along with caves, sinkholes, and natural bridges, are all features of karst regions. Slightly acidic groundwater flows through cracks in rock, slowly dissolving the rock. The cracks widen to form cavities and eventually a subterranean drainage system.
- Check the box <The State of Geologic Map Compilation (SGMC)>
- Hover over <The State of Geologic Map Compilation (SGMC)> and click on legend.
 - ? Thinking of the area which had both springs and sinkholes, what type of rock is most prevalent in that area? (Dolomite is very prevalent).
 - ? Remembering there are sinkholes located along the Mississippi River, what type of rock is most prevalent? (Limestone)
 - ? What type of rock lends itself to a Karst region? (Limestone and Dolomite)

Science

Extend

What about caves?

- Leaving <Missouri Counties> and <The State Geologic Map Compilation> checked, open Karst again.
- Only check <Cave Density>
- Hover over <Cave Density> and click on the legend
 - ? Where are most of the caves in Missouri located? (Same area as springs and sinkholes)

BOOKMARK

- At the top of the map, click the Measure button.
- Hover and click the Distance button.
- Click continuously along what you want to measure.
- Double-click to finish.

MEASURE

- At the top of the map, click the Bookmarks button.
- Choose your bookmark; the map will take you there.

Next Steps

DID YOU KNOW? ArcGIS Online is a mapping platform freely available to U.S. public, private, and home schools as a part of the White House ConnectedED Initiative. A school subscription provides additional security, privacy, and content features. Learn more about ArcGIS Online and how to get a school subscription at <http://connected.esri.com>.

THEN TRY THIS...

- Log in to your ArcGIS organization account and perform analysis on World Mountain Ranges.
- Use the Find Location tool to find mountain ranges located within 100 miles of any plate boundary.
- Create an expression to find World Mountain Ranges **Within A Distance Of 100 Miles** From Tectonic Boundaries.



TEXT REFERENCES

This GIS map has been cross-referenced to material in the mountain building section of chapters from middle-school texts.

- *Earth Science by Glencoe McGraw Hill – Chapter 6*
- *Earth Science by McDougal Littell – Chapter 3*
- *Earth Science by Prentice Hall – Chapter 7*
- *Earth Science by Tarbuck and Lutgens—Chapter 9*

WWW.ESRI.COM/GEOINQUIRIES

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