It's in the Water!

Horses need at least 10 gallons of water a day! That's a lot of water. Kentucky has water that is very good for horses because it contains calcium carbonate. You drink milk because it has calcium in it, and calcium builds strong bones and teeth. The calcium in Kentucky's natural waters is good for the horses' bones, too. So how did milk get into Kentucky's water?

Objectives

- Students will develop an understanding of why certain geographical areas in Kentucky provide better habitats for breeding and raising horses.
- Students will learn how natural weather events, such as acid rain, contribute to small changes on the earth's surface.
- Students will explore how weathering and erosion can leak calcium carbonate into the groundwater for animal consumption.
- Students will construct an argument based on experimentation that limestone in Kentucky's soil is released into the water through the process of weathering and erosion.

Supplies/Resources

- 12 oz. Clear plastic cups (3 per group)
- Distilled water
- Distilled white vinegar
- Limestone rock/chips
- Markers
- Measuring cup (1/4 cup)
- 2 Buckets or large bowls for waste
- Strainer for cleanup
- Student worksheets
- Pencil

Teacher Suggestions

- This exploration lab can be done in groups or as a single student lab.
- To save time on clean-up, have a large bucket labeled "Used Water" and a container labeled "Used Limestone."
- A simple strainer can be used by students to pour the water through to collect the limestone. This will keep students from "touching" any of the vinegar.

Kentucky Academic Science Standards

3-LS4-3. Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all.

3-LS3-2. Use evidence to support the explanation that traits can be influenced by the environment.

4-ESS1-1. Identify evidence from patterns in rock formations and fossils in rock layers to support an explanation for changes in a landscape over time.

4-ESS1-2. Make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation.

4-ESS2-2. Analyze and interpret data from maps to describe patterns of Earth's features.

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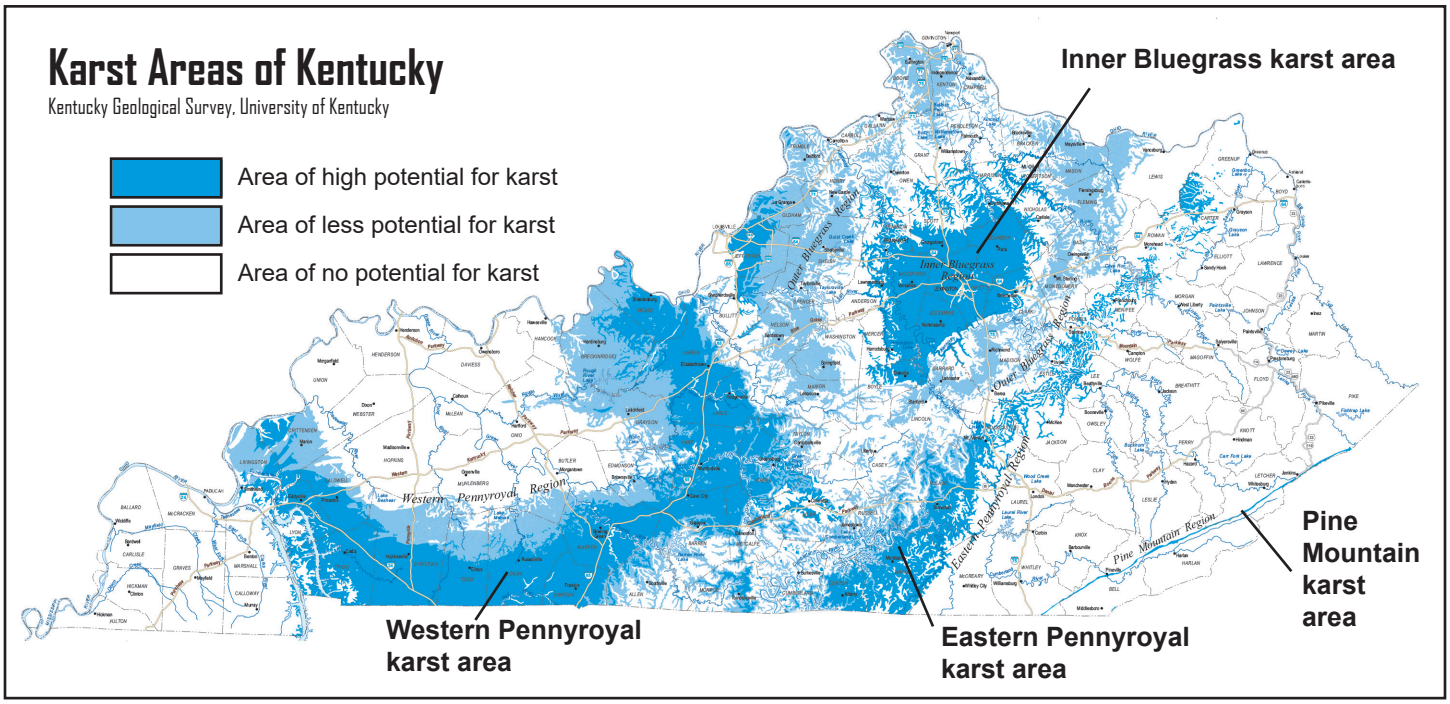
Water from natural springs is one of the key factors that separates this state from others in regard to breeding and raising horses. They drink the water and eat water-fed grasses. Water is key to life, and it certainly is key to Kentucky's horse industry, as well as other farm businesses. Large areas of Central Kentucky, the heart and home of many horse farms, is made up of an area known as karst. Karst is an area of land consisting mostly of a sedimentary rock called limestone, also known as calcium carbonate or calcite. This bed of limestone was formed when calm, shallow seas covered much of Kentucky. Tiny sea creatures and shells sank to the bottom where they decomposed, leaving the remains of their hard parts (bones and shells) that solidified over time, creating the present-day limestone. Over periods of time, the limestone has been weathered by acidic water (acid rain), dissolving the limestone into its elemental components, namely calcium and carbon. This calcium-rich water feeds the natural springs that fill the many creeks and ponds from which horses drink. Grasses absorb the calcium-rich water from the soil and are fortified by the ancient creatures.



ACTIVITY: With your teacher's help, place a star on the map where your school is located. Are you located in the rich karst areas of Kentucky? Using your new understanding of karst areas or limestone rock, what can this map tell you about regions of Kentucky? Discuss this with your teachers and classmates.

Limestone is a commonly found sedimentary rock in Kentucky.

What are two other names limestone can be called?

_____ _____ or _____

What do you call large areas of land that consist of limestone? _____

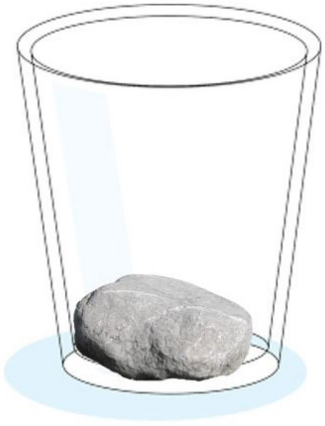
The Earth's surface is constantly changing. Sometimes these changes occur very quickly, like during an earthquake or a flood. Sometimes these changes take place more slowly through weathering and erosion. Weathering is the process where water, wind, ice, and growing plants s-l-o-w-l-y break down rock into smaller pieces where it can get mixed into the present soil. In Kentucky, nearly half of our rock is limestone. Limestone in Kentucky weathers due to rain. There are small amounts of acid in our rainwater. Acids are chemicals that can wear away or erode limestone. Although the small amounts of acid in Kentucky's rain is not harmful to us, the collection of groundwater over time can begin to erode karst areas and release the calcium and carbon into the soil and surrounding ponds and creeks. When limestone is broken down, we say it is being weathered due to chemical changes.

Conduct your own investigation on the effects of acid rains on limestone.

Materials:
3 clear plastic cups, measuring cup, distilled water, white vinegar, limestone chips, marker for labeling, pencil

Directions:
1. Place limestone rocks in each of the three containers.
2. Label one container distilled water. Fill the cup half-way with the distilled water.
3. Label the second container acid rain. Fill the cup half-way with the distilled water and add 1/4 cup of vinegar.
4. Fill the third cup half-way with vinegar only.
5. Draw your observations below.

Distilled Water Only



Distilled Water & Vinegar

Vinegar Only

Write what you observed:

1. Based on your observations, what made the limestone begin to fizz? What proof can you provide?

_____

_____

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_____

2. Would you agree that vinegar must have some type of "acid" in it? Why or why not? Please provide evidence.

_____

_____

_____

3. Some people say that Kentucky's water is the best kind of "milk" for a horse. Why do you think they say this? Demonstrate how you've connected the science you've learned with the popular beliefs of some horsemen.

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Arthur Boyd Hancock III, grandson of Arthur Boyd Hancock who founded the historic Claiborne Farm, stated in an interview, "People came in here and started raising horses because of the bone it put on—just good, big, nice yearlings. My grandfather came from Virginia, and they just found they raised better horses here (in Kentucky)."
The Courier-Journal, September 25, 2010.

If you could talk with Mr. Hancock today, what would you tell him?