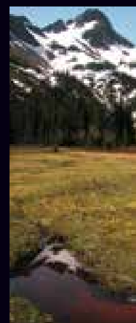
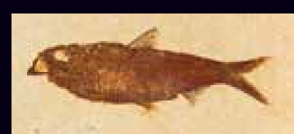
EARTH SCIENCE ACTIVITY CALENDAR

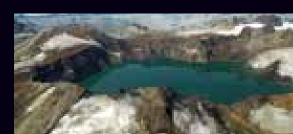
OUR SHARED GEOHERITAGE

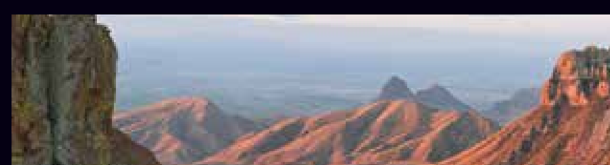
2016-17 SCHOOL YEAR CALENDAR • EARTH SCIENCE WEEK 2016



This publication was produced with support from the U.S. Geological Survey; National Park Service; National Aeronautics and Space Administration; American Association of Petroleum Geologists Foundation; Esri; ExxonMobil; American Geophysical Union; Society for Mining, Metallurgy, and Exploration; AmericaView; Howard Hughes Medical Institute; Archaeological Institute of America; Geological Society of America; and Association of American State Geologists.



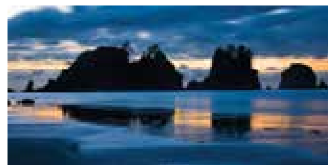


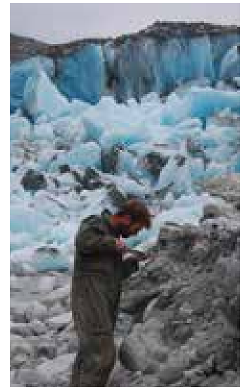


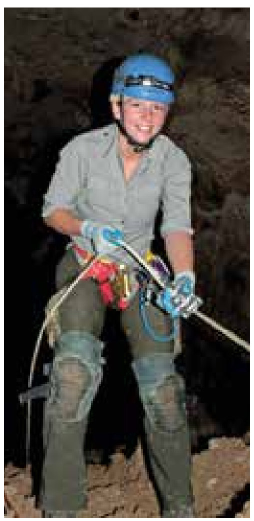
EARTH SCIENCE WEEK

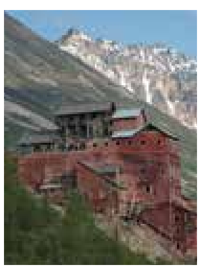
AMERICAN GEOSCIENCES INSTITUTE • WWW.AMERICANGEOSCIENCES.ORG

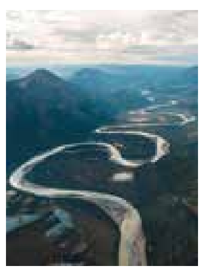
Share Your Heritage











When we look around, we see a rich collection of natural wonders, landforms, and resources, formed over eons through interactions of our planet's geosphere, hydrosphere, atmosphere, and biosphere. But what do we call it? This is what Earth scientists refer to as our geoscience heritage, or, as it is commonly known worldwide, "geoheritage."

Earth Science Week 2016 focuses on the theme of "Our Shared Geoheritage," promoting public understanding and stewardship in many areas, including Earth science, energy, paleontology, water quality, conservation, and climate science. The celebration's learning resources and activities are engaging young people and others in exploring many ways of effectively studying, managing, using, and conserving our shared geoheritage.

How can you begin to appreciate the natural inheritance that is yours? Start with a visit to the Earth Science Week website (www.earthsciweek.org). Check out new links to educational resources and information. Engage young people and others in discovering how Earth science reveals the natural change processes that produce our geoheritage.

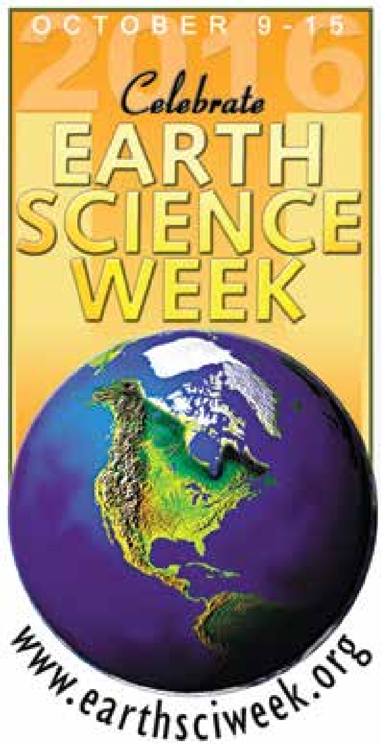
And keep learning about Earth science throughout the school year. Use this calendar, which features education resources, important geoscience dates, and exciting academic activities. Connect with geoscience learning all year long!

Geoff Camphire

Geoff Camphire
Outreach Programs Manager
American Geosciences Institute

AGI american geosciences institute
connecting earth, science, and people

Linking to Earth Science Week



This year, you're invited to join the tens of millions of participants in all 50 states and nations worldwide who are celebrating Earth Science Week. This exciting event has grown steadily in momentum and participation since the American Geosciences Institute held the first Earth Science Week in 1998.

Every year, people in schools, workplaces, civic centers, and elsewhere celebrate Earth Science Week to help build public understanding and appreciation of the Earth sciences, promote recognition of the value of Earth science research, and encourage stewardship of the planet. Earth Science Week serves the geoscience community by:

- giving students new opportunities to discover the Earth sciences,
- highlighting the contributions made by the geosciences to society,
- publicizing the message that Earth science is all around us,
- encouraging responsible stewardship of the planet through an understanding of Earth processes,
- providing a forum where geoscientists can share their knowledge and enthusiasm about the Earth and how it works, and
- making learning about Earth science fun!

Whether you are a faculty member, student, parent, geoscientist, or ordinary citizen, you can play a leading role in Earth Science Week. On the event's website at www.earthsciweek.org, you'll find ideas and tips for planning activities at your school or workplace, along with contact information for geoscience resources in your area where you can work with local geoscientists to plan activities.

In addition, this calendar features a variety of exciting activities that you can conduct—in the schoolyard, at home, or elsewhere in the community—to explore the theme "Our Shared Geoheritage." This year's theme encourages people everywhere to learn about the dynamic interactions of the planet's natural systems.

Let us know how you are planning to celebrate! Send us an email at info@earthsciweek.org. Celebrate Earth Science Week:

OCTOBER 9-15, 2016!

WWW.EARTHSCIWEEK.ORG

How can you get involved? Explore the Earth Science Week website at www.earthsciweek.org. You'll find a host of tools designed to make your event experience easy, fun, and rewarding!

On the website, you'll see a list of tips to help you share your Earth science knowledge with young people, lead an excursion, or attend an event in your area: a planning checklist, tips for fundraising, recommendations for working with the news media, ideas for events, educational activities, ways to get official recognition, downloadable logos and images, kit ordering information, a map of potential partners and activities near you, and much more.

To stay up-to-date on the latest developments and upcoming activities, subscribe to the *Earth Science Week Update* electronic newsletter at www.earthsciweek.org. Check it out!

LEARNING ACTIVITY:

Rain and Soil

Grade Level: 5-10

Materials

- Access to a green space or schoolyard garden
- Ring infiltrometers (supplies needed: large metal coffee can or other clean metal can, ruler, marker)
- Water
- Graduated cylinder
- Stopwatch
- Tiller or garden spade

Source: Soil Science Society of America. Adapted with permission.

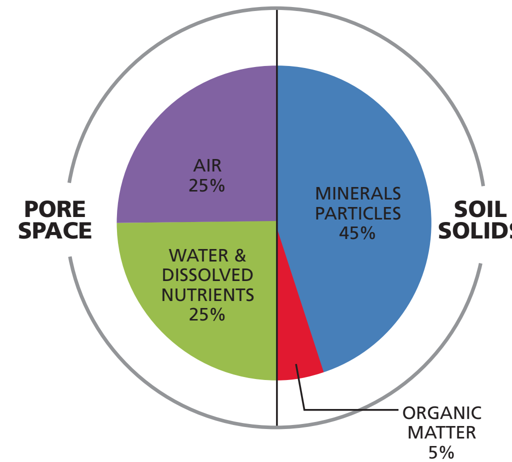
When it rains, much of the water drains directly into the ground. But why?

Soil is made up of four main components: minerals, organic matter, water, and air. Ideal percentages are shown in the figure, but in reality the percentages vary from location to location. Water moves through open spaces in soil known as "pores." More and larger pores allow water to move freely, whereas fewer and smaller pores restrict water movement. Restricted flow can cause water to pool at the surface, resulting in big muddy patches. It can also cause water to flow over the land surface, leading to erosion.

Compaction of soil can contribute to size and numbers of pores. Soil can become compacted many ways, and this can have long-term effects. For example, when American settlers traveled the Oregon Trail in their wagons in the 1800s, soil became so compacted that we still can see wheel ruts today. Try the following experiment and draw your own conclusions about compaction and pore size in soil.

Procedure

1. Create your own ring infiltrometer using the instructions found at www.soils4teachers.org/esw.
2. Locate two patches of soil or grass near (but not directly next to) each other: one people have walked on quite a bit, and one mostly undisturbed.
3. Sink your infiltrometers about a third of the way into the soil in each patch to the mark you made. (Try to not break up soil or grass much.)
4. At the first patch, fill the infiltrometer with water to your pre-marked line and start the stopwatch. Continue adding water to the line and measuring the amount added as you go. After two minutes, stop the stopwatch and note the time and total volume of water added.
5. Repeat the experiment at the other patch (or run the experiments simultaneously with two teams).
6. Calculate the infiltration rate (equations provided in link in Step 1) by dividing the depth of water that ran through by the time elapsed.



Kathy Zuzek, University of Minnesota Extension

Extension: Repeat the experiment by locating a third area that can be tilled. Till an area of soil uniformly using a tiller or garden spades without destroying medium-sized soil clods. Once the soil has been tilled to a "fluffy" consistency, stomp down on half of the tilled area to compact it.

Discussion

View slides of macropores and micropores (see link in Step 1). Discuss:

1. What factors affect water infiltration, storage, and runoff in soils?
2. How do surface soil aggregation, compaction, and porosity affect infiltration, storage, and runoff?
3. Based on what you've learned, what practices would you implement or avoid at your home or school?

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
	1	2	3	4	5	6
7 **Friendship Day**	8	9	10	11	12	13
14	15	16	17 **Did You Know?** Hurricane Camille (Category 5) Strikes Mississippi, Louisiana and Virginia, 1969	18	19	20 **Did You Know?** Florissant Fossil Beds National Monument, Renowned for Insect Fossils, Authorized 1969
21	22	23	24 **Did You Know?** Hurricane Andrew (Category 5) Hits Florida and Louisiana, 1992	25 **Did You Know?** Hurricane Katrina (Category 5) Strikes Florida, Later Louisiana, 2005	26	27 **Did You Know?** Colonel Edwin Drake Drills First U.S. Oil Well in Titusville, Pennsylvania, 1859
28	29	30	31			

LEARNING ACTIVITY:

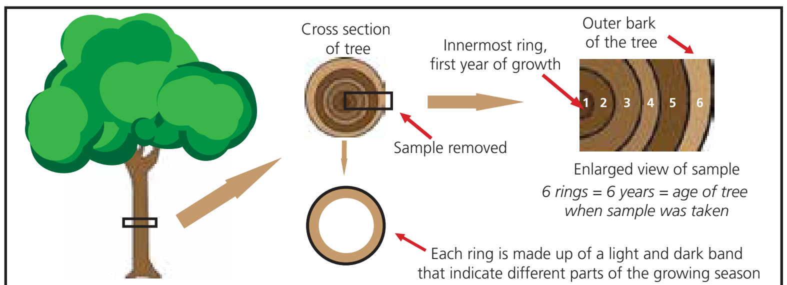
Tree Rings and Ancient Climatic Conditions

Grade Level: 6-9

How do archaeologists learn about climatic conditions and their effects on people in the past? In 1815, Mount Tambora in Indonesia erupted so violently that the explosion could be heard 1,600 miles away. Gases from the volcano shot almost six miles above the Earth's surface and lingered for years. Sulfur dioxide combined with water molecules to form sulfate particles that reflected sunlight away from Earth, gradually causing the planet's surface to cool. The colder temperatures caused severe weather events worldwide.

Archaeologists know about some negative effects of the eruption from historical documents that record crop failures, cold temperatures, and scarce food and fuel. The eruption and its effects also affected tree growth—a clue to the past for archaeologists.

In the cross section of a tree trunk, you see a series of rings. Every year a tree is alive, it grows a little wider, and that growth is represented by a ring. A ring has two parts. The wider, lighter-colored portion represents the beginning of the growing season. The darker, thinner part represents the latter part of the season. The width of a ring depends on the weather. In years with sufficient rain and warmth, rings are wider; but dry or cold years produce thinner rings.

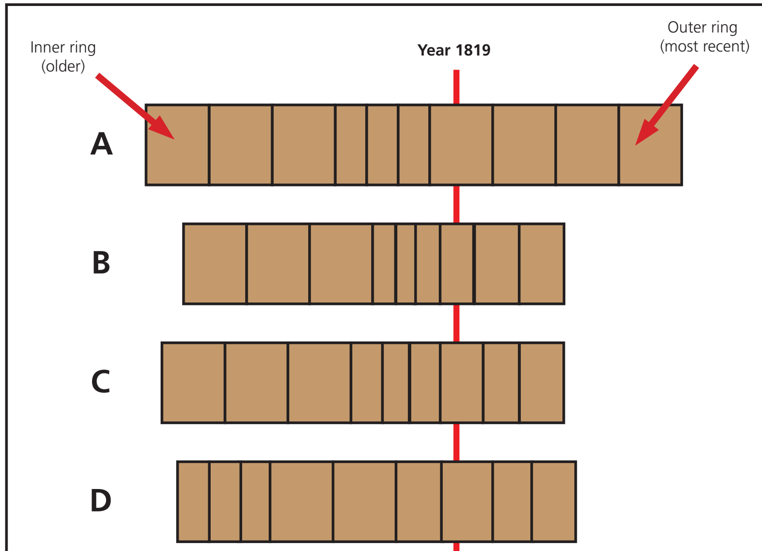


Rings seen in the cross section of a tree reveal the age of the tree when the sample was removed.

Source: Archaeological Institute of America. Adapted with permission.

Procedure

1. See sample cross sections of trees below. Each is arranged with the oldest, innermost ring at left and the most recent, outermost ring at right. The ring for the year 1819 is marked across all cross sections. For each, do the following steps.
2. Determine the year in which the sample was taken and the number of years represented in each sample.
3. Using the date line provided, find the tree rings for 1815 (the year of the eruption). What do the rings on either side of the eruption look like? How was growth affected?
4. How is cross section D different from the rest? Explain.
5. If you were an archaeologist, what else could you look at for evidence of the effect of Tambora's eruption on people?



SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
				1	2 **Did You Know?** Unnamed Hurricane (Category 5) Batters Florida Keys, 1935	3
4	5 **Labor Day**	6 **Sept. 6-9, 2016: Geoscience Event:** AAPG International Conference and Exhibition, American Association of Petroleum Geologists, Cancun, Mexico **Protect Your Groundwater Day**	7	8	9	10 **Sept. 10-13, 2016: Geoscience Event:** AIPG National Meeting, American Institute of Professional Geologists, Santa Fe, New Mexico
11 **Patriot Day**	12	13 **Did You Know?** Hurricane Ike (Category 4) Strikes Texas, 2008	14	15	16 **Citizenship Day** **Constitution Day**	17
18 **Sept. 18-24, 2016: Geoscience Event:** 58th AEG Annual Meeting, Association of Environmental and Engineering Geologists, Kona, Hawaii	19	20	21	22 **Did You Know?** Hawaii Volcanoes National Park, Containing World's Most Active Volcano, Established 1961 **Autumnal Equinox**	23	24 **Did You Know?** Hurricane Rita (Category 5) Batters Texas and Louisiana, 2005 **National Public Lands Day**
25 **Sept 25-28, 2016: Geoscience Event:** Geological Society of America Annual Conference, Denver	26 **Sept. 26-28, 2016: Geoscience Event:** SPE Annual Technical Conference and Exhibition, Society of Petroleum Engineers, Dubai, UAE	27	28	29	30	

LEARNING ACTIVITY:

Exploring Geoheritage From Space

Grade Level: 5-9

Materials

- Internet to access NASA Earth Observatory (earthobservatory.nasa.gov) or the NASA DVD, *National Parks from Space*, in the Earth Science Week 2016 Toolkit

NASA Earth Observatory image of Yellowstone National Park. The yellow line marks the park boundary, with Mammoth Hot Springs, in the upper section.

Source: NASA.
Adapted with permission.

Great images of geoheritage sites can be found everywhere. But no one holding a camera on Earth can "back away" far enough to get the extraordinary perspective captured by NASA satellites. In celebration of Earth Science Week 2016, NASA's Earth Observatory has created a special collection of images and articles showcasing geoheritage sites in America's national parks.

Two such sites are Yellowstone National Park (Wyoming/Montana/Idaho) and Hot Springs National Park (Arkansas). Both have hot springs, a natural phenomenon that makes the areas geologically unique, culturally significant, and recreationally important.

The water in hot springs originates from precipitation. Clouds release rain and snow, which fall in the watershed and filter through the ground. As the water moves deeper into Earth's interior, it is heated *geothermally*. This is because the temperature of rocks within the Earth increases with depth, generally 2-3°C (3-5°F) for every 90 m (300 feet) of depth. The rate of temperature increase with depth is known as the *geothermal gradient.*

If this hot water can rapidly make its way back through cracks and fissures to the surface before cooling, it creates a hot spring. When a spring happens to sit on top of a supervolcano, as is the case in Yellowstone, things are bound to get hotter. The temperature in some springs there can exceed 94°C (199°F)!

People go to Hot Springs National Park to bathe in the warm water. Not so in Yellowstone, where water can reach the boiling point. Instead, people visit Yellowstone hot springs to savor the natural beauty.

NASA Earth Observatory image of Hot Springs National Park. The white line marks the park boundary, with the city of Hot Springs, Arkansas, to the south.

Human activities impact both areas. Recent interest in potentially developing geothermal energy sources near Yellowstone, as well as urban development adjacent to Hot Springs National Park, may further change these valued geoheritage places.

NASA will continue to use the vantage point of space to increase understanding of our home planet, including our shared geoheritage.

Procedure

1. Go to the NASA Earth Observatory (EO) articles:
   - *Hot Springs National Park* (http://bit.ly/NASA_EO_HotSprings)
   - *Satellites Track Yellowstone's Underground Heat* (http://bit.ly/NASA_EO_Yellowstone)
2. Read and use information from the EO articles, and above, to respond:
   - What evidence supports the idea that geothermal features in Yellowstone (e.g., hot springs and geysers) may or may not be connected?
   - Design a plan for monitoring human impact on the hot springs area of either or both national parks.
   - Use the example of a hot spring to illustrate how Earth's geosphere, biosphere, hydrosphere, and atmosphere interact.

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
						1
2 **Rosh Hashanah begins (sundown)**	3	4 **Rosh Hashanah ends**	5	6	7	8
9 **Oct. 9-15, 2016: Earth Science Week** **International EarthCache Day**	10 **Columbus Day**	11 **Earth Observation Day** **No Child Left Inside Day** **Yom Kippur begins** **Happy Birthday!** Thomas Dibblee, U.S. Geologist, Pioneering California Cartographer, Born 1911	12 **Yom Kippur ends** **National Fossil Day**	13 **Geoscience for Everyone Day**	14 **Geologic Map Day**	15 **International Archaeology Day**
16 **Oct. 16-22, 2016:** National Chemistry Week **Oct. 16-21, 2016: Geoscience Event:** SEG International Exhibition and 84th Annual Meeting, Society of Exploration Geophysicists, Dallas	17 **Did You Know?** San Francisco's 1989 Earthquake (Estimated Magnitude 6.9) Rocks Northern California, 1989	18	19	20	21	22
23 **Did You Know?** Fossil Butte National Monument, Containing Nearly Perfectly Preserved Fossils, Established 1972 30	24 31 **Halloween**	25	26	27 **Oct. 27-29, 2016: Geoscience Event:** NSTA Area Conference, National Science Teachers Association, Minneapolis	28	29

EARTH SCIENCE WEEK

LEARNING ACTIVITY:

Cracked Plates & Tectonics

Grade Level: 5-10

Materials

- A computer/projector with internet connection

Take these "tech tips."

- Measure: 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.
- Bookmarks: At the top of the map, click the Bookmarks button. Choose your bookmark; the map will take you there.
- **The Map URL is http://esriurl.com/earthgeoinquiry6.**

Source: Esri.
Adapted with permission.

In this activity, you'll investigate dynamics in Earth's crust that explain multiple Earth science phenomena. For the full activity, go to http://esriurl.com/ESW2016.

Procedure

1. **Engage.** Click the map link and project the map onto a screen for the whole class to see. With the Details pane visible, click the button, Show Map Contents. Turn on the layer, Global Quakes Of Large Magnitude 5.8 Or Greater.
   - Do you see any pattern to where this larger collection of quakes occurs? A common misconception is that quakes occur just around continents or oceans. Quakes define plates around both sections of continents and oceans together. There are exceptions, of course.
   - What is happening to the entire area within any ring of earthquakes? This area moves as one piece, so no collisions are happening inside a single piece of crust called a plate.
2. **Explore.** Turn on the layer, Relative Motion At Plate Boundaries. (Note that you will not see anything until you perform the next step.) Click each of the bookmarks: South America, California, and Mid Atlantic Ridge.
   - How would you describe the different ways these plates could interact? South America would have a direct collision, California would have a side swipe, and Mid Atlantic would be torn apart.
3. **Explain.** Earthquakes occur where large pieces of Earth's crust run into, pull away from, or slide against other pieces of independent crust. Turn on the layer, Plate Boundaries. To show the legend, click the layer name, Plate Boundaries. Choose each bookmark in turn (South America, California, and Mid Atlantic Ridge).
   - What are plates that collide head-on called? Convergent.
   - What are boundaries called where plates are stretched apart? Divergent.

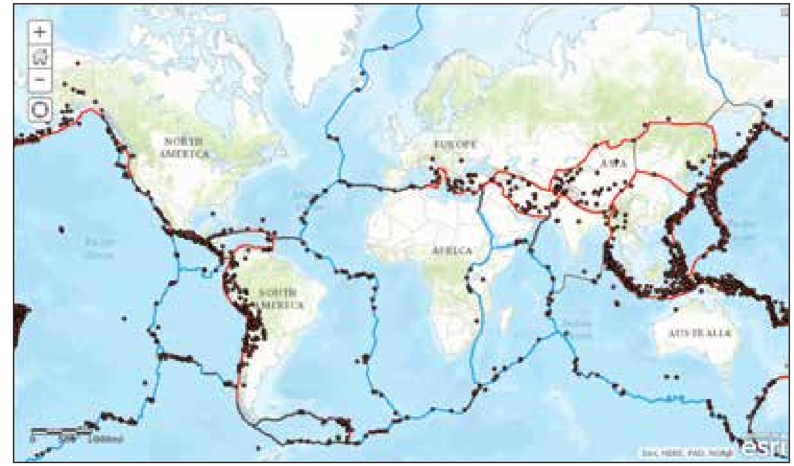


Figure 1: Global quakes of magnitude 5.8 or greater and plate boundaries.

Figure 2: North America with global quakes, California quakes, and Caribbean quakes visible.

- What are boundaries called where plates hit at other directions, causing a sideswipe collision? Transform.
- Turn off the Global Quakes Of Large Magnitude 5.8 Or Greater layer.

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
		1 **Happy Birthday!** Alfred Wegener, German Meteorologist, Framer of Continental Drift Theory, Born 1880	2	3	4	5
6 **Nov. 6-9, 2016: Geoscience Event:** ASA-CSSA-SSSA International Annual Meeting, Phoenix, Arizona **Daylight Saving Time Ends**	7 **Happy Birthday!** Marie Curie, Polish Geochemist and Physicist, Born 1867	8	9	10 **Nov. 10-12, 2016: Geoscience Event:** NSTA Area Conference, National Science Teacher's Association, Portland, Oregon	11 **Veterans Day**	12
13	14 **Happy Birthday!** Charles Lyell, Scottish Geologist, "Principles of Geology" Author, Born 1797	15	16 **GIS Day (Geographic Information Systems Day)**	17	18	19
20	21	22	23	24 **Thanksgiving**	25	26
27	28	29	30			

LEARNING ACTIVITY:

Watch Out for Landslides

Grade Level: 5-8

Materials

- 500 mL of fine sand
- a dry container such as a can or jar
- Funnel
- Protractor
- Newspaper (to cover flat surface)
- Calculator
- Paper and pen (to record findings)
- 500 mL of dry materials such as mud, gravel, soil, table salt or granulated sugar, along with a can or jar large enough to hold this material, and a piece of cardboard large enough to cover it (optional; see steps 7-9 below)

To minimize risk of landslides, the slope of land and the materials underground must be considered when planning how to build in a community. Altering the slope of the land, or even the amount of vegetation on a slope, can have dangerous consequences.

How might the slope of land determine development in a community? How might changing the slope of land—by cutting through the land to build a road, for example—create potential hazards?

Procedure

1. Cover a flat surface, such as a lab table, with newspaper. Slowly pour 500 mL of dry sand through a funnel onto the flat surface so that it makes a pile. Describe what happens to the sides of the pile as you pour the sand.
2. Hold a protractor upright (with the bottom edge held against the flat surface) and carefully begin to slide it behind the pile.
3. At the point where the curved upper edge of the protractor intersects the surface of the pile of sand, read the angle in degrees. This is the natural angle of the side (slope) of the pile. It's called the angle of repose. This is the steepest slope that can be formed in the material without the material slumping or sliding down the slope.
4. Repeat step 3 several times. Record the measurement of the angle of the slope each time.
   Do you get the same angle each time? Why or why not? Why is it important to make this measurement several times? What do you think will happen to the angle with a greater or lesser amount of sand? How might the addition of water, as in heavy rains or flooding, affect the risk of sliding?
5. Repeat steps 1, 2 and 3 using different amounts of sand. Record the measurement of the angle of the slope each time. Does the angle of the slope change? If so, how much?

6. Pour extra sand onto a pile of sand several times. Record the measurement of the angle of the slope each time. Does the angle of the pile change?
7. *Optional:* To study the slopes of other dry materials, gather materials such as coarse sand, clay or mud, gravel, silt, soil, table salt, and granulated sugar. Predict what will happen if you repeat steps 1-6 using these materials.
8. For each of these materials:
   - Place a handful of the material in a dry container such as a jar.
   - Cover the container with a piece of cardboard and turn the container upside-down onto a flat surface.
   - Lift the container very slowly. The material should form an inverted, cone shaped pile.
   - Measure the angle of the slope of the pile. Make three measurements for each material.
9. Record measurements on a chart like the one below. How does particle size and shape relate to the maximum slope angle the particles will maintain?

MATERIAL	ANGLE MEASURE OF SLOPE			AVERAGE ANGLE
Fine Sand				
Coarse Sand				
Clay				
Gravel				
Silt				
Soil				

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
				1 **Dec. 1-3, 2015: Geoscience Event:** NSTA Area Conference, National Science Teachers Association, Columbus, Ohio	**2** **Did You Know?** Aniakchak National Monument, One of World's Finest Examples of Dry Caldera, Established 1980	**3**
4	**5** **World Soil Day**	**6** **Dec. 6-14, 2015: Hanukah Begins (Sundown)**	**7** **Pearl Harbor Remembrance Day**	**8**	**9**	**10**
11 **Dec. 11, 2016: Geoscience Event:** Exploration Station at AGU Fall Meeting, San Francisco **International Mountain Day**	**12** **Dec. 12-16, 2016: Geoscience Event:** AGU Fall Meeting (Including AGU-NESTA GIFT Workshop), American Geophysical Union, San Francisco	**13**	**14**	**15**	**16** **Did You Know?** First of Three Earthquakes in New Madrid, Missouri (Estimated Magnitude 8.0), Causes Mississippi River to Change Course, 1811	**17**
18	**19**	**20**	**21** **Winter Solstice**	**22**	**23**	**24**
25 **Christmas** **First Day of Hanukkah**	**26** **Did You Know?** Earthquake Off West Coast of Northern Sumatra (Magnitude 9.0), Sets Off Massive Tsunami, 2004 **Dec. 26, 2016-Jan. 1, 2015: Kwanzaa**	**27**	**28**	**29**	**30**	**31** **New Year's Eve**

LEARNING ACTIVITY:

Exploring Geoheritage Through EarthCaching

Grade Level: 3-12

Materials

- Computer with internet connection
- GPS unit or smartphone with free GeoCaching app

An EarthCache is a special place that you can visit to learn about a unique geoscience feature or aspect of our Earth. Visitors to EarthCache sites can see how our planet has been shaped by geological processes, how we manage resources, and how scientists gather evidence to learn about Earth.

EarthCaches are part of the greater global adventure game of "geocaching." Unlike traditional geocaches, which are hidden containers with logbooks that people hide and seek using GPS devices, EarthCaches have no container. Instead of signing a logbook, visitors to EarthCaches undertake an educational task related to the geoscience of the site. In this way, a visit to an EarthCache is a learning experience as well as a wonderful outdoor activity in which the whole family can participate.

Many EarthCaches are situated at locations that represent the best of our shared geoheritage. For example, there are a number of EarthCaches located near Mt. St. Helens, such as "The Big Bang" at the Johnston Ridge Observatory, that help teach the story of the volcano's geologic and cultural importance.

Educators can learn more about Mt. St. Helens and its connection to our nation's geoheritage by joining GSA for a Teacher Field Camp (http://doiop.com/geoventures) during the summer of 2017. This camp takes place at Mt. St. Helens in July 2017.

Procedure

1. Visit an EarthCache to learn about geoheritage. Go to www.earthcache.org to view a list of EarthCaches in your area.
2. Once you select an EarthCache to visit, print the latitude and longitude coordinates along with any informational pages that you may want to have with you.
3. Enter the latitude and longitude for the EarthCache site into your Global Positioning System receiver (GPSr) by creating a new waypoint.
4. Set your GPSr to the waypoint you just entered to find that location. Your GPSr will take you to within 15 feet of your EarthCache site.
5. Take notes and answer the questions posed to you by the EarthCache listing.
6. Once you are back in the classroom, log your visit by clicking on the EarthCache that you visited. You can rate the EarthCache, record your answers to receive credit, and upload photos.

Extension

Once you have visited several EarthCaches, you may decide to take your EarthCaching skills to the next level. Create your own EarthCache to teach others about geoheritage. To learn more about creating your own EarthCache, visit www.earthcache.org and download the free teachers guide!

THE GEOLOGICAL SOCIETY OF AMERICA®

Source: Geological Society of America. Adapted with permission.

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
1 **New Year's Day** **Last Day of Hanukkah**	**2**	**3**	**4**	**5**	**6**	**7**
8 **Did You Know?** Voyageurs National Park, Featuring Some of North America's Oldest Rocks, Established 1975	**9**	**10**	**11**	**12** **Did You Know?** Earthquake (Magnitude 7.0) Strikes Capital of Haiti, Causing Nearly 300,000 Deaths, 2010	**13**	**14** **Happy Birthday!** Arthur Holmes, British Geologist, Pioneer of Radioactive Dating of Minerals, Born 1890
15	**16** **Martin Luther King, Jr. Day**	**17** **Happy Birthday!** Benjamin Franklin, U.S. Scientist, Pioneering Inventor and Diplomat, Born 1706 **Did You Know?** Northridge Earthquake (Magnitude 6.7) Strikes Los Angeles Area, California, 1994	**18**	**19**	**20**	**21**
22	**23** **Happy Birthday!** Andrija Mohorovicic, Croatian Physicist, Seismologist and Meteorologist, Namesake of Base of Earth's Crust, the "Moho," Born 1857	**24**	**25**	**26**	**27**	**28**
29 **Happy Birthday!** Friedrich Mohs, German Geologist and Mineralogist, Creator of Scale of Mineral Hardness, Born 1773	**30**	**31**				

LEARNING ACTIVITY:

Density of Minerals

Grade Level: 6-9

Materials

- One 1-2 liter graduated cylinder with gradations of no more than 10 mL scale capable of weighing about 1-200 grams
- Samples of several different identified minerals of various densities
- Supplemental materials: Complete density activity, density worksheet, density chart found at www.MineralsEducationCoalition.org/ESW (see sidebar)

Source: Minerals Education Coalition; Society for Mining, Metallurgy, and Exploration. Adapted with permission.

Density is an intrinsic physical property of minerals that relates to the composition of the mineral and to the pattern in which the mineral's atoms are arranged. "Intrinsic" means that the property is the same for the mineral, no matter what the size or shape of the sample.

In this activity, students will measure and compare the densities of minerals.

Procedure

1. **Estimating density:** You can determine the relative density of minerals by comparing their size (estimated by sight) to how heavy they feel in your hand. Record your results.

2. **Measuring density:** Measure the mass (in grams) of each mineral sample available to you. The mass of each sample is measured using a balance or electronic scale. Record mass on a chart.

   The volume of each sample can be measured by the amount of water displaced by the sample in a graduated cylinder. Half-fill the graduated cylinder with water. Note the volume of the water and record it. Drop each mineral sample into the cylinder and record the level of the water in the graduated cylinder for each sample. Calculate the volume of each sample by subtracting the initial water volume from the volume after the sample was added. Record the volume of each sample on your chart in milliliters (mL).

   Measure density by dividing the mass or weight of a sample by its volume. Written out, the formula for calculating density is: $D = M/V$, where D = density (g/mL), M = mass (g), and V = volume (mL). Record the density of each sample on your chart in grams per milliliter (g/mL).

3. **Analysis of results:** How do your density data compare to your estimates of the relative densities of the minerals? Compare your results to those obtained by other groups for the same mineral samples. If there are differences in the densities for the same mineral, suggest reasons for the variation.

4. **Application of analysis:** What are some applications in industry or daily life where differences in the densities of various materials might be useful?

This activity has been adapted with permission from the Nevada Mining Association. For more information on the importance of mining and minerals in everyday life, visit www.MineralsEducationCoalition.org/ESW.

GOLD PANNING

Early U.S. settlers panned for alluvial deposits of gold. Gold panning is the separation process of gold flakes and nuggets from the surrounding dirt. Gold panning works because the density of gold is six times that of the dirt in which it's found. Find all the materials needed for gold panning in your classroom at www.MineralsEducationCoalition.org/ESW.

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
			1	2 **Groundhog Day**	3	4
5	6	7 **Did You Know?** Earthquake (8.8 Magnitude) Shakes Chile, Triggering a Tsunami that Hits Hawaii, 2010	8	9	10	11 **Did You Know?** Death Valley National Park, Lowest Below Sea Level in North America, Proclaimed 1933
12 **Happy Birthday!** Charles Darwin, English Naturalist, "The Origin of Species" Author, Born 1809	13	14 **Valentine's Day**	15	16	17	18
19 **Feb. 19-25, 2017: National Engineers Week**	20 **Presidents Day**	21	22	23	24	25
26 **Did You Know?** Grand Canyon National Park, Exhibiting Largest Section of Geologic Time on Earth, Established 1919	27	28				

LEARNING ACTIVITY:

Natural Gas Formation

Grade Level: 6-12

Materials

- Two bags of fresh bean sprouts (you will need to buy one 10 days after the first)
- Two bags of fresh lettuce (you will need to buy one 10 days after the first)
- 1 cup measure
- Three gallon-size zip-closing plastic bags
- Black Sharpie™
- Refrigerator
- Sunny window
- Metric tape measure
- Notebook and pen

Source: American Association of Petroleum Geologists. Adapted with permission.

An important component of our shared geoheritage is our planet's wealth of natural resources. Natural gas, which is mostly methane, is an energy resource used for generating electricity and heating, powering transportation, and manufacturing products. Right now, one-quarter of the world's energy comes from natural gas.

Natural gas formation, one of the processes occurring on our ever-changing Earth, takes a very long time. Natural gas is formed from marine organisms that die, sink to the bottom of the ocean, and get covered with sediments. Most of the dead organisms decay before becoming covered with sediments. Some of them, however, are buried along with the rest of the sediment. As more and more sediment is deposited over time, the temperature slowly increases. If the pattern of the temperature increase is just right, some of the dead organisms are changed into natural gas and oil.

In this investigation, you will make a simple model of how gases can form from decaying material. You will also explore the effects of temperature on gas formation.

Procedure

1. Tear the lettuce into small pieces. Measure out a cup of lettuce and a cup of bean sprouts into one plastic bag. Press out all the air in the bag, seal it securely and use the Sharpie™ to label it with the date and the word "Refrigerator." Measure the circumference of the bag with your tape measure. Record this number and any observations you have about the bag in a notebook. Put this bag into the hydrator, or "crisper," in your refrigerator.
2. Prepare the second plastic bag in the same way, but label this one "Sunny Window." Record the circumference of the bag and any observations in your notebook. Put the bag in a sunny window or other warm place.
3. Every day for 10 days, check on both of your bags. Measure and record their circumferences and any other observations you may have. At the end of the 10 days, compare both bags and write down what you measure and observe. Compare the state of the lettuce and bean sprouts with fresh samples of these vegetables. What happened to them over the 10-day period?
4. *Discuss:* How can you account for changes in the bags over 10 days? How can this investigation help you to understand how natural gas forms? What is the role of heat in forming natural gas?

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
			1 **Did You Know?** Yellowstone National Park, Containing Half of World's 1,000 Known Geysers, Becomes First National Park, Established 1872 **Ash Wednesday**	**2**	**3**	**4**
5	**6** **March 6-12, 2017: National Ground Water Awareness Week**	**7**	**8**	**9**	**10**	**11**
12 **Daylight Saving Time Begins**	**13**	**14** **Happy Birthday!** Albert Einstein, German-American Physicist, Author of "Theory of Relativity," Born 1879	**15**	**16**	**17** **St. Patrick's Day**	**18**
19	**20** **Vernal Equinox**	**21**	**22** **World Water Day**	**23**	**24** **Happy Birthday!** John Wesley Powell, U.S. Geologist and Anthropologist, Grand Canyon Explorer, Born 1834	**25**
26	**27** **Did You Know?** Great Alaska Earthquake (Magnitude 9.2) Is Second-Largest of 20th Century and Largest Recorded in Northern Hemisphere, 1964	**28**	**29**	**30** **March 30- April 2, 2017: Geoscience Event:** NSTA National Conference on Science Education, National Science Teachers Association, Los Angeles	**31**	

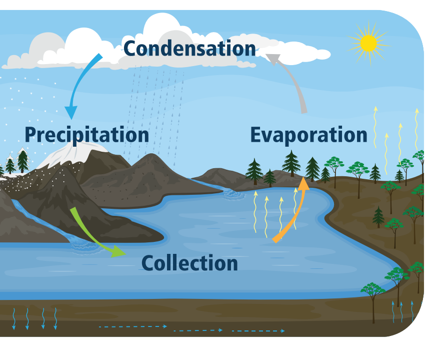
LEARNING ACTIVITY:

What-a-Cycle

Grade Level: 4-12

Materials

- A computer with internet connection and a printer
- Nine station cards (www.srh.weather.gov/jetstream/atmos/images/ll_whatacycle_smallcards.pdf)
- Nine large stations (www.srh.weather.gov/jetstream/atmos/images/ll_whatacycle_labels.pdf)
- Work sheets (www.srh.weather.gov/jetstream/atmos/images/ll_whatacycle_worksheet.pdf)
- 25+ dice and pencils



Conceptual water cycle

Source: National Oceanic and Atmospheric Administration. Adapted with permission.

Water moves from Earth's surface to the atmosphere and then returns to the surface. This process is nearly always depicted in water cycle diagrams by arrows drawn in a circular direction.

However, the actual path water may take in its cycle is far more complicated. In this activity, you will discover multiple cycles by acting as water molecules and traveling through parts of the overall water cycle. In the end, your water cycle will look nothing like the conceptual model but will represent a more realistic cycle.

Procedure

1. Print out materials. Place the nine large station cards around the room and have the nine two-sided cards turned with the picture facing up at each matching station.
2. Each student takes a die and worksheet. Half of the students should be at the Oceans station. Do not place anyone in the Plants section. Evenly spread the remaining students among the remaining stations.
3. On the worksheet, have each student circle his or her starting location.
4. Each student rolls their die and, based on the number rolled, turns over that card to determine his or her next move through the water cycle.
5. If told to move, students draw an arrow on their worksheets from the starting location to the current position. Label that arrowhead with a number 1. Then move to the new location.
6. If told to stay, place the number 1 inside the drawn circle.
7. Roll the die again.
8. If told to move, draw an arrow on the worksheet from the current location to the new position. Label that arrowhead with a number 2. Then move to the new location.
9. If told to stay, write a number 2 at the current location.
10. Repeat the roll-and-move procedure 10 times total.

Discussion

Most of the students in the class should have traveled to several stations and completed some sort of cycle. Some may have traveled through most of the water cycle, while others have moved very little. There also may be a student or two who remain in the ocean through all 10 turns.

IF 100,000 PEOPLE REPRESENTED ALL WATER ON EARTH, WHERE WOULD THEY BE LOCATED?

WATER SOURCE	TOTAL WATER (%)	NUMBER OF PEOPLE
Oceans	97.24	97,240
Glaciers & Snows	2.14	2,140
Aquifers	0.61	610
Rivers & Lakes	0.017	17
Ground	0.005	5
Atmosphere (w/clouds)	0.001	1
Plants	0	0

While this exercise is meant to be somewhat realistic, it is actually far more complicated to leave the ocean via evaporation, since nearly all of Earth's water is confined to oceans. To truly represent the water cycle, we would need about 100,000 people located at each station, as seen in the table. Not only would there be over 97,000 people who represented the ocean, it would take nearly 3,600 rolls of the die before just one person moved to the Atmosphere station via evaporation. This exercise also does not take into consideration human and animal interactions with the water cycle. The water humans and animals consume is stored and eliminated, or it evaporates (via perspiration).

For additional lessons, visit: www.srh.weather.gov/srh/jetstream/.

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
						1 **Did You Know?** Start of Midwest Flood of Upper Mississippi River Basin That Would Cover Nine Midwestern and Great Plains States, 1993 **April Fool's Day**
2 **April 2-5, 2017:** AAPG Annual Meeting, American Association of Petroleum Geologists, Houston	**3**	**4**	**5**	**6**	**7**	**8**
9	**10** **Passover begins**	**11**	**12** **Did You Know?** Arches National Park, World's Highest Concentration of Natural Arches, Established 1929	**13**	**14** **Did You Know?** Start of Mount Eyjafjallajökull Eruption in Iceland, Grounding Flights Across Europe for Almost a Week, 2010	**15**
16	**17**	**18** **Did You Know?** Great 1906 San Francisco Earthquake (Estimated Magnitude 7.8) Tears 270-Mile Rift Along San Andreas Fault, 1906	**19** **Did You Know?** Soviet Union Launches Salyut 1, First Space Station, 1971	**20**	**21** **Did You Know?** Start of Great Flood of Mississippi River Valley That Would Inundate 27,000 Square Miles, 1927	**22** **Earth Day**
23 / **30**	**24**	**25**	**26**	**27**	**28** **Arbor Day**	**29**

LEARNING ACTIVITY:

Rock Art in the National Parks

Grade Level: 3-8

Materials

- Egg carton
- Flat rocks (or brown wrapping paper)
- Natural painting tools, such as moss or grass
- Natural pigments:
  - Black = charcoal or soot
  - Green = crushed leaves or grass
  - Brown = soil
  - Shimmer = crushed mica or pyrite ("fool's gold")
  - Blue or purple = blueberries or purple grape skins
- Binders: egg whites or gum arabic
- Water
- Paper cups
- Computer with internet access

Source: Views of the National Parks, National Park Service. Adapted with permission.

Human beings have been linked to Earth materials since prehistoric times. They used caves for shelter, shaped rocks into stone implements, and later refined metals to make tools. Beyond practical purposes, Earth materials also were used to make pigments for paint. Rock walls became canvases where ancient artists expressed themselves. In this exercise, we will explore the link between Earth materials and art.

Rock art—including petroglyphs (designs chipped into rock) and pictographs (designs painted on rock)—may be found in many national parks of the United States. These petroglyphs and pictographs consist of painted or chipped symbols resembling people, animals, plants, natural features, and abstract images. We can learn much about ancient peoples by studying the art left behind on rocks.

Archaeologists have discovered cave drawings as ancient as 30,000 years old in parts of Europe and Asia. Rock art is a priceless part of our geoheritage that must be protected—so please do not touch the art and do not deface the paint or rock "canvas."

Procedure

1. *Discuss:* What connected ancient peoples and the Earth? What is the difference between petroglyphs and pictographs? How can we use this information to understand ancient ecosystems and cultures?
2. Look at examples of rock art, and discuss what the symbols might represent. Information and images are available at the "Views of the National Parks" website (http://go.nps.gov/views-petroglyph).
3. Make your own paint using natural ingredients. First, fill egg carton hollows with various natural pigments.

4. Slowly add a binder such as lightly beaten egg whites or gum arabic to one pigment (this holds pigment particles together and makes paint "stick"). Stir carefully until the pigment is fully mixed with the binder. Pour a little water slowly into the hollow while stirring the mixture. Keep adding water until the paint mixture turns into a liquid.
5. After preparing the first paint, repeat the process by adding binder and water to the other pigments.
6. Using your paint and natural tools, create a pictograph on brown paper. Cave artists spread the paint with their fingers, with brushes made of reeds and hair, or with pads of moss. Create a symbol that represents something important in your life.
7. Share your pictograph with the class, describing how the pictograph was created and its meaning. Discuss the importance of protecting pictographs as part of our geologic heritage.

For additional lessons, visit http://go.nps.gov/views.

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
	1	2 **National Teachers' Day**	3	4 **Did You Know?** Powerful Tornado (F-5) Rips Greensburg, Kansas, 2007	5 **Cinco De Mayo**	6
7	8	9	10	11	12	13
14 **Did You Know?** Lewis and Clark Expedition Across Louisiana Territory Begins, 1804 **Mother's Day**	15	16	17	18 **Did You Know?** Mount St. Helens Volcano Erupts South of Seattle, Washington, 1980	19	20 **Armed Forces Day**
21	22 **Did You Know?** Chile Earthquake (Magnitude 9.5) Is Largest Earthquake of 20th Century, 1960	23	24 **Did You Know?** Powell Expedition to Explore Grand Canyon Begins in Green River City, Wyoming, 1869 **Happy Birthday!** Harry Hess, U.S. Geologist, Originator of Idea of Sea Floor Spreading, Born 1906	25 **Did You Know?** Mammoth Cave National Park, World's Longest Cave System With 360 Mapped Miles, Established 1926	26	27
28 **Happy Birthday!** Milutin Milankovitch, Serbian Geophysicist, Best Known for Theory of Climate Change, Born 1879	29 **Memorial Day**	30	31			

LEARNING ACTIVITY:

Geoheritage Via Google Street View

Grade Level: 6-12

Materials

- Computer with internet access

Image from Street View, Grand Canyon

Google's Street View is a rich resource for exploring geoheritage, since it visually transports us to many impressive sites across the country and around the world. Street View allows you to investigate a site, even one you don't know well, which can lead to important insights. Of course, the real power and fun of Street View is that it allows you to explore by moving your visual perspective around the image.

Procedure

1. Look at the image of a Street View page shown here. What do you notice? What catches your eye might be aesthetic, scientific, or cultural. For example, here you might notice the colors of the canyon walls. While those are mainly earth tones of brown, orange, and gray, they are also streaked with green.
2. The image on this page is from the "Bright Angel Trail" image on Street View. You can locate it by browsing the Street View gallery at www.google.com/maps/streetview/. This image is from the "Grand Canyon" collection. You can go directly to the "Grand Canyon" collection at https://goo.gl/5uZYh1.
3. Using Street View, you can explore the Bright Angel Trail of the Grand Canyon. Noticing things like color, texture, and shape can lead to questions, especially when you take a scientific perspective. For example, why do some places in the canyon have plants, while others don't? What other questions might you ask?
4. Street View can be a great tool to conduct investigations to address your questions. In Street View, click on the image to move your view and gather more information about elements of the site. Look closely at the canyon wall nearest to you, then move along the trail to look at other surfaces. How does the casual idea of noticing take on a more focused purpose when observations and data can be collected via Street View?
5. Now draw conclusions from evidence. Organize your ideas to facilitate analysis by making a table with three columns; Evidence, Conclusion, Reasoning. As you consider the evidence for your conclusions, pay attention to what you observe, versus what you can infer. For example, what can you observe about features such as slope, types of plants, and surface characteristics (e.g., broken rubble versus a solid layer)? What can you infer about attributes that you are unable to observe directly using the image, such as amount of moisture and sunlight?

CONCLUSION	EVIDENCE	REASONING

6. Consider the ideas you have about the place shown in Street View. Write several ideas in the Conclusions column. Then in the Evidence column, describe your observations and other information related to those ideas. Then in the Reasoning column, tell how you used the evidence to support the conclusion.
7. Extend your ideas about this location by comparing it with others. Visit additional locations, such as national parks and historic sites, using Street View (e.g., https://goo.gl/l0xFCY). How is the Grand Canyon different from or the same as other sites that can be seen in Street View?
8. Many of the sites in Street View are there because of their natural splendor, their connection to people, and for other reasons that relate to geoheritage, such as a location's aesthetic, artistic, cultural, ecological, recreational, scientific, economic, or educational value. Use Street View to explore a geoheritage location of your own choosing. Why do we celebrate and conserve such places? How can scenes from Street View help you communicate your ideas about geoheritage resources?

Google

Source: Google. Adapted with permission.

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
				1	2	3 **Happy Birthday!** James Hutton, Scottish Geologist, "Father" of Modern Geology, Born 1726
4	5	6	7	8	9	10
11	12 **Did You Know?** Big Bend National Park, Featuring Fossilized Skeleton of Quetzalcoatlus, Largest Winged Animal, Established 1944	13	14 **Flag Day**	15 **Did You Know?** The Philippines' Mount Pinatubo Erupts in Second-Largest Volcanic Eruption of 20th Century, 1991	16	17
18 **Father's Day**	19 **Did You Know?** U.S. Viking 1 Becomes First Spacecraft to Land Safely On Mars, 1976 **Juneteenth**	20	21 **Summer Solstice**	22	23	24
25	26	27	28	29	30 **Asteroid Day**	

LEARNING ACTIVITY:

Groundwater Movement

Grade Level: 4-9

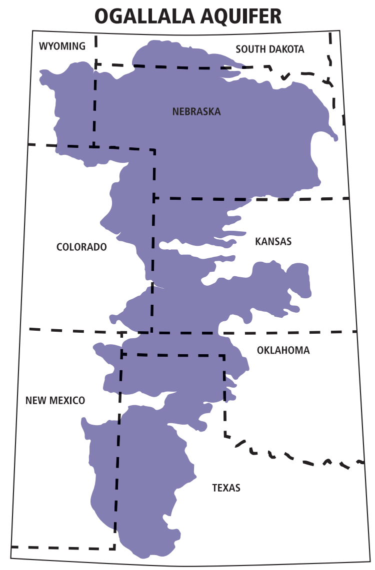
Materials

- Three clear 16- to 20-ounce plastic soda bottles with holes punched in the bottom (or three clear plastic cups with holes punched in the bottom)
- Equal amounts of gravel, sand, and clay
- Magnifying glass
- Graduated cylinder for measuring water
- Colored water

Water that accumulates beneath the surface of the Earth is called groundwater. Contrary to popular belief, groundwater does not form underground "rivers," but is actually found in the small spaces and cracks between rocks and other material such as sand and gravel. Groundwater supplies about 38 percent of the water used for agriculture in the United States.

The layer of earth, gravel, or porous stone that yields water is called an aquifer.

If hazardous waste, chemicals, heavy metals, or oil collect on the surface of the ground, rain or runoff percolating into the soil can carry these substances into the groundwater.



The Ogallala Aquifer (pronounced Oh-Ga-La-La) is one of the largest aquifer systems in the world, stretching across parts of eight states—South Dakota, Nebraska, Wyoming, Colorado, Kansas, Oklahoma, New Mexico, and Texas—and underlying about 174,000 square miles. It is approximately the size of California and contains an estimated 4,000,000,000,000,000 liters of water.

The following activity involves learning how water moves through rock materials such as sand, gravel, and clay.

Procedure

1. Predict how water will move through gravel, sand, and clay. Which type of material will allow water to pass through it most quickly?
2. Test your hypothesis by filling three different soda bottles or plastic cups to the same level with earth materials—gravel in the first, sand in the second, and clay in the third. The material should fill the containers to a depth of about 8 cm.
3. Look closely at each container with the naked eye and with a hand-held magnifying glass. Do you want to adjust your hypothesis after looking at the materials?
4. To demonstrate how groundwater moves through underground rock formations, pour about 120-240 mL of colored water into each container. Record your results and discuss them as a class. Which container emptied the fastest? Which emptied the slowest? How do the different materials influence water movement in natural systems?

Source: Bureau of Land Management. Adapted with permission.

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
						1
2	3	4 **Independence Day**	5	6	7	8
9	10	11	12	13	14 **Happy Birthday!** Florence Bascom, U.S. Geologist, First American Female Ph.D., Born 1862	15
16	17	18	19	20 **Did You Know?** U.S. Apollo 11 Astronaut Neil Armstrong Becomes First Human to Walk on Moon, 1969	21	22
23 **Parents' Day** 30 **Happy Birthday!** Marie Tharp, U.S. Geologist, Sea Floor Cartographer, Born 1920	24 31	25	26	27	28	29

What Is Earth Science Week?

The American Geosciences Institute has organized this annual international event since 1998 to help people better understand and appreciate the Earth sciences and to encourage responsible stewardship of the planet. Earth Science Week takes place October 9-15, 2016, celebrating the theme "Our Shared Geoheritage."

Visit the Earth Science Week website–www.earthsciweek.org–to learn more about how you can become involved, events and opportunities in your community, the monthly Earth Science Week newsletter, highlights of past Earth Science Weeks, and how you can order an Earth Science Week Toolkit.

You are invited to help keep the spirit of Earth Science Week alive all year long by posting this calendar in your classroom, office, or home. Whoever you are and wherever you go, you can celebrate Earth science!

AGI american geosciences institute
connecting earth, science, and people

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USGS science for a changing world · National Park Service · NASA · America View · SME Society for Mining, Metallurgy & Exploration · AGU American Geophysical Union · The Geological Society of America · ExxonMobil · esri · hhmi BioInteractive · AASG Association of American State Geologists

AGI MEMBER SOCIETIES

AGI Member Societies
AASP— The Palynological Society
American Association of Geographers
American Association of Petroleum Geologists
American Geophysical Union
American Institute of Hydrology
American Institute of Professional Geologists
American Rock Mechanics Association
Association for the Sciences of Limnology and Oceanography
Association for Women Geoscientists
Association of American Geographers
Association of American State Geologists
Association of Earth Science Editors
Association of Environmental & Engineering Geologists
Clay Minerals Society
Council on Undergraduate Research, Geosciences Division
Environmental and Engineering Geophysical Society
Friends of Mineralogy
Geo-Institute of the American Society of Civil Engineers
Geochemical Society
Geological Association of Canada
Geological Society of America
Geological Society of London
Geoscience Information Society
History of Earth Sciences Society
International Association of Hydrogeologists/ U.S. National Chapter
International Medical Geology Association
Karst Waters Institute
Mineralogical Society of America
Mineralogical Society of Great Britain and Ireland
National Association of Black Geoscientists
National Association of Geoscience Teachers
National Association of State Boards of Geology
National Cave and Karst Research Institute
National Earth Science Teachers Association
National Ground Water Association
National Speleological Society
North American Commission of Stratigraphic Nomenclature
Paleobotanical Section of the Botanical Society of America
Paleontological Research Institution
Paleontological Society
Petroleum History Institute
Seismological Society of America
SEPM (Society for Sedimentary Geology)
Society for Mining, Metallurgy, and Exploration
Society of Economic Geologists
Society of Exploration Geophysicists
Society of Independent Professional Earth Scientists
Society of Mineral Museum Professionals
Society of Vertebrate Paleontology
Society for Organic Petrology
Soil Science Society of America
United States Permafrost Association

EARTH SCIENCE WEEK

October 9–15, 2016

FUTURE DATES

October 8–14, 2017
October 14–20, 2018
October 3–19, 2019

Earth Science Week Staff: Edward Robeck, Geoff Camphire, Katelyn Murtha, Brendan Soles
Design: Angela Terry Design
Printing: American Web
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