LESSON 2

The Distribution of Natural Resources

The water in the Ladybower Reservoir in England is used to generate electrical energy and to provide drinking water for people in several cities.

By the end of this lesson . . .

you will be able to explain why natural resources are unevenly distributed on Earth.

Go online to view the digital version of the Hands-On Lab for this lesson and to download additional lab resources.

CAN YOU EXPLAIN IT?

What determines where gold is found in nature?

Gold is an important natural resource. It is used to make reliable computer circuits, repair damaged teeth, and lubricate machinery in space vehicles.

Gold deposits that are worth mining exist only in certain places in the world. In the United States, major gold deposits are found in Alaska, California, Colorado, and Nevada. The United States is among the top gold-producing countries in the world, which also include China, Australia, Russia, and Canada.

1. Why do you think gold deposits are found in the places listed above? Do you think natural processes, human processes, or both have an impact on these places?

EVIDENCE NOTEBOOK As you explore the lesson, gather evidence to help explain where gold is found in nature.

Explaining Patterns in Natural Resource Distribution

What natural resources did you use today? Do you know where they came from? Most resources, including minerals and fossil fuels, are found in specific places on Earth.

Oil, also called petroleum, is a nonrenewable resource found in specific locations beneath Earth's surface. Oil is processed to make paint, plastics, gasoline, cosmetics, technological products, and clothing.

2. Discuss Oil is used to generate electrical energy and make many products. The amount of oil on Earth is limited. How might this affect the search for oil in the future?

Natural Resource Distribution

Earth's many natural resources, including oil, water, soil, minerals, wind, and sunlight, are unevenly distributed on Earth's surface. In other words, resources are concentrated in specific places because of the processes by which they form. For example, fossil fuels found today were formed by different geologic processes. Each process took place in a certain location under specific conditions. For example, most of the coal we use today formed where tropical swamps existed millions of years ago. However, salt deposits formed where seawater entered a shallow bay. As the water evaporated, dissolved materials were left behind and layers of minerals, such as salt, formed. Because many geologic processes occur over millions of years, resources formed in these ways tend to be nonrenewable. Some resources, such as wind and sunlight, are renewable. However, these resources are also limited in their distribution.

Geologic processes can also move and change resources. Therefore, not all natural resources are found where they first formed. For example, rocks containing gold can be uplifted and exposed at Earth's surface. Weathering breaks rock down into small pieces of sediment, and erosion carries the sediment away. As a result, gold can be found in streams downhill from the rock where it came from. Geologic processes can also change resources. For example, calcite, a mineral used in medicine and building materials, can be dissolved by water and then deposited in a new form in a different location.

3. Mineral resources, such as gold deposits, may take millions of years to form. The same is true for oil, coal, and natural gas. Because of these timescales, these resources are renewable / nonrenewable. In other words, humans use the resources more slowly / quickly than the resources form.

Soil

Soil is an essential part of the Earth system. Soil is important to the biosphere because it provides a place for plants, animals, and other organisms to live. Plants use nutrients and water from soil to grow and survive. Humans use soil to grow food. Soil even plays an important role in storing water, which helps prevent flooding.

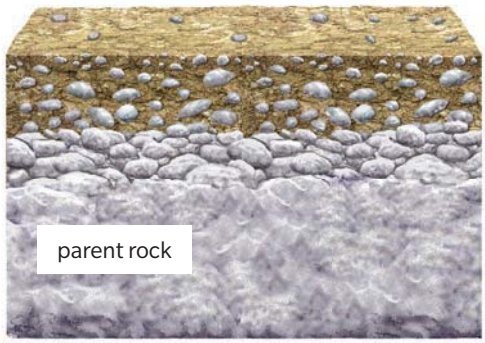
Soil takes hundreds or even thousands of years to form. The conditions required for soil to form do not exist everywhere on Earth, so soil distribution is not uniform. The rate of soil formation and the type of soil that forms depend on factors such as rock type, climate, and the presence of organisms. Soil forms on land where rock is broken down by chemical and physical weathering processes. Wind, water, plant roots, and animals all weather rock. The type of soil that forms depends in part on the characteristics, such as color and composition, of the parent rock that breaks down into sediment. Therefore, different soils are found in different places on Earth.

Some soils are more fertile than others. Soil fertility depends on how much organic matter and other nutrients the soil has. Organic matter in the soil comes from dead organisms and animal waste. Bacteria and fungi break down organic matter and release chemical byproducts that mix with the top layer of soil. These materials are the nutrients that make the soil better able to support plant life.

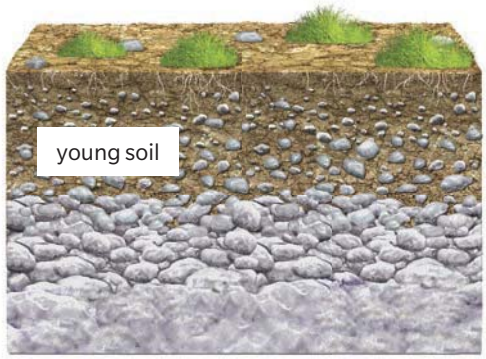
The shape of the land also affects soil distribution. The tops and sides of hills and mountains often have less soil than valleys have because wind and water erode materials on hillsides. Eroded materials are deposited in valleys.

4. Is healthy, nutrient-rich soil a renewable or nonrenewable resource? Use evidence and scientific reasoning to support your claim.

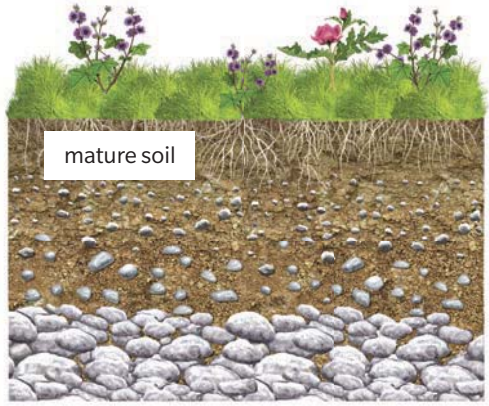
Steps in Soil Formation



Rock is broken down into smaller and smaller pieces. These fragments of rock are called *sediment*.



Over time, sediment mixes with air, water, and organic matter present in the ground. The soil can now support some plant life.



More organic matter is added as organisms die and decompose. This process makes a nutrient-rich layer of soil at the surface called *topsoil*.

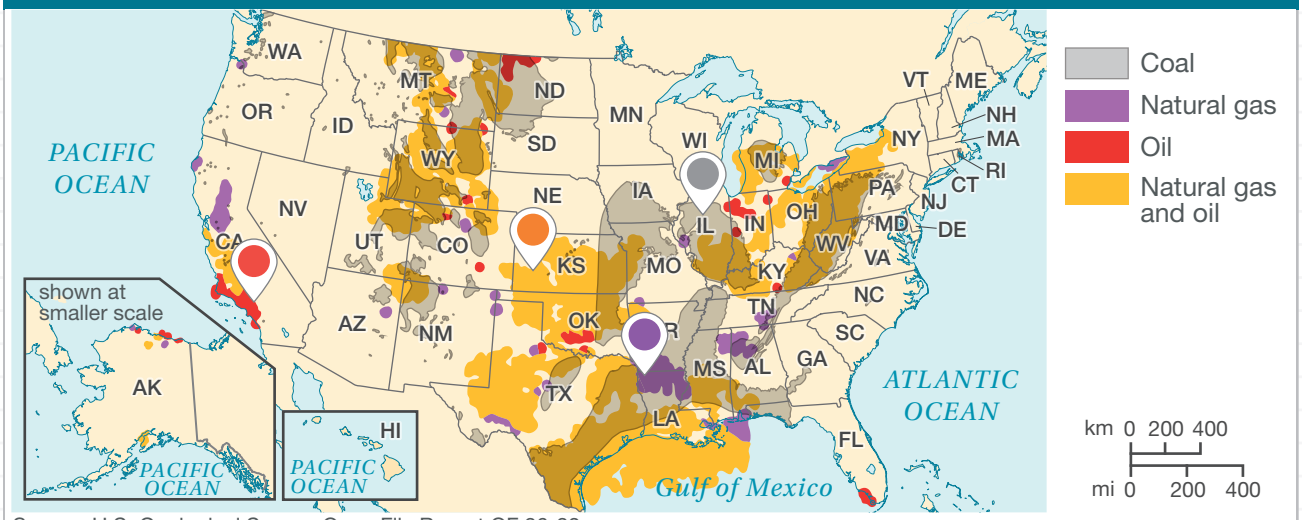
Nonrenewable Energy Resources

Nonrenewable energy resources include fossil fuels such as oil, coal, and natural gas. Fossil fuels are burned to turn turbines that generate electrical energy. Natural gas is used to heat homes and to cook. Oil is also used to make plastics and gasoline.

Fossil fuels are nonrenewable because the processes that form them take place over millions of years. That is much longer than one thousand human lifetimes. The processes that formed fossil fuels millions of years ago still occur today. So, millions of years in the future, there will be new deposits of fossil fuels that are forming right now.

Look at the map. Each fossil fuel is found in specific places because it forms by specific geologic processes. For example, coal and oil form by different processes and from different materials. The diagram shows the processes by which oil deposits form.

Fossil Fuel Deposits in the United States



Source: U.S. Geological Survey, Open File Report OF 96-92.

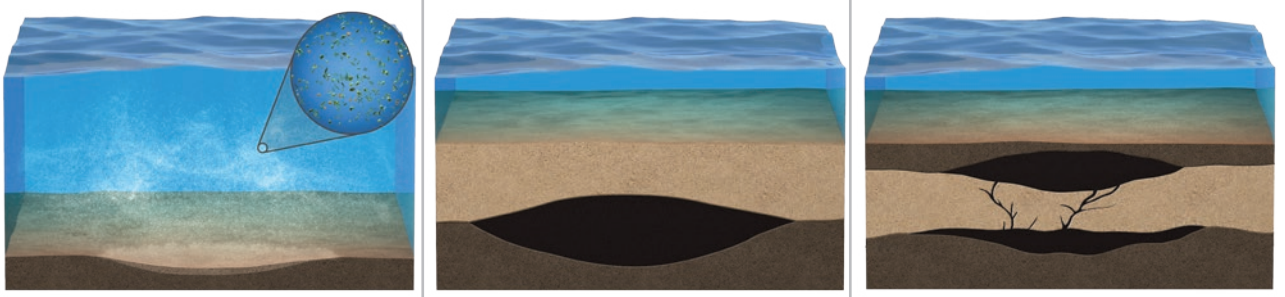
Oil formed where dead marine life collected on the sea floor and was buried by sediment. Heat and pressure turned the organic remains to oil.

Oil and natural gas form by similar processes, so these resources are commonly found together in permeable rock.

Natural gas formed by a process similar to oil formation. This gas tends to rise toward Earth's surface to form deposits in permeable rock.

Most coal formed in ancient swamps where dead plants piled up to form peat. When peat is buried, heat and pressure turn the peat into coal.

Steps in Oil Formation



In some parts of Earth's ancient seas, large numbers of microscopic marine organisms died and collected in layers on the ocean floor.

Sediment collected in layers over the organisms. The weight of the sediment increased pressure on the remains of the organisms. Over time, the sediment turned to rock.

Increased pressure and heat caused a chemical reaction that changed carbon, hydrogen, and oxygen in the remains of the organisms into a thick liquid—oil.

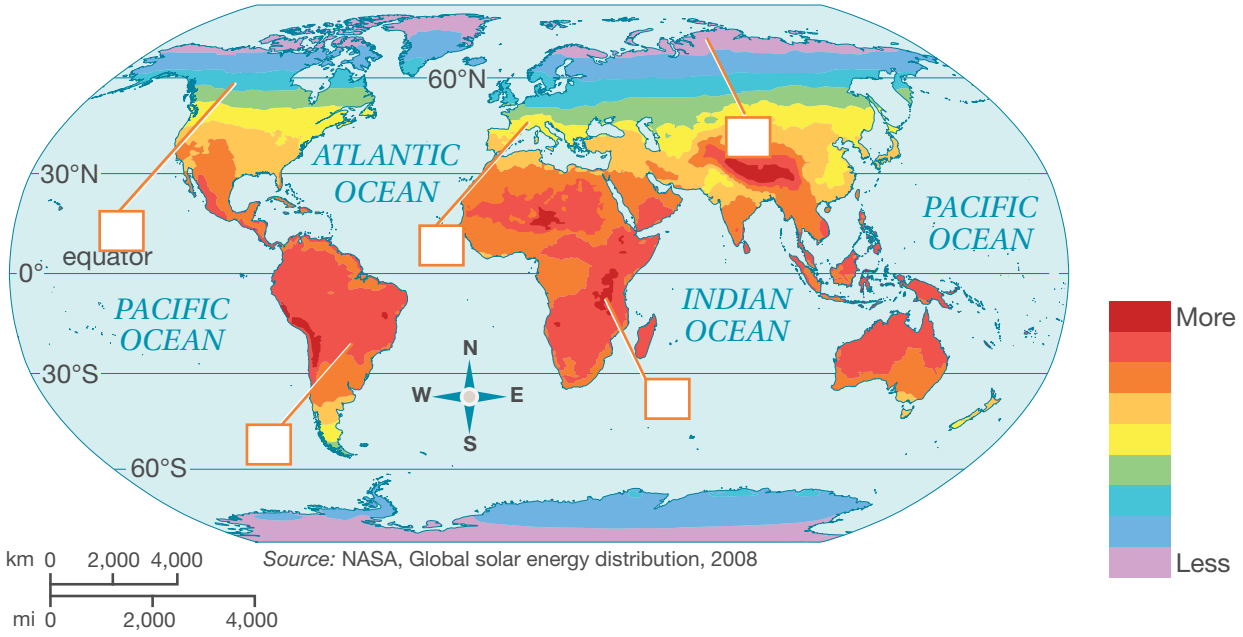
5. Locate one area where oil is found on the fossil fuel distribution map. Describe the likely geologic history of that region. Explain the reasoning behind your description.

Renewable Energy Resources

Like nonrenewable energy resources, alternative energy resources are distributed unevenly on Earth's surface. These resources include sunlight, wind, water, and biomass. *Biomass* is plant matter that can be burned for heat or used to make other fuels. Crops, plant waste, and trees are all types of biomass. These resources are considered renewable because they can be replenished more rapidly than they are used by humans.

Worldwide Distribution of Solar Energy

6. Label the map using the numbers 1 through 5 to help a solar energy company decide where to install new solar panels. The number 1 represents the most desirable location and 5 represents the least desirable location.



Source: NASA, Global solar energy distribution, 2008

Places that receive a lot of sunlight are the best for using solar energy. Sunlight is unevenly distributed across the globe. Near the equator, daytime and nighttime hours are roughly equal throughout the year. Near Earth's poles, daytime is long in summer and short in winter. However, closer to the poles, sunlight is less intense than it is near the equator throughout the year. Some places, such as coastal cities, experience frequent cloud cover, which can reduce solar energy availability.

Wind and water resources are also unevenly distributed. Wind can be harnessed to generate electrical energy where wind blows consistently and in a predictable direction. Hydroelectric energy is usually generated by harnessing large amounts of moving river water. Dams are built to control the flow of water in some rivers, but not every river has enough water or a strong enough flow for a hydroelectric dam.

Mineral Resources

Minerals are mined and processed for a wide range of uses. Minerals are used for making buildings and roads, for making electronics, and even for making cosmetics. Mineral deposits may take millions of years to form and tend to be nonrenewable. Not all minerals are found in their pure form. Most often, a mineral is mixed with several other minerals in rock. A deposit that has a high enough concentration of a specific mineral to be worth mining is called an *ore*. For example, an iron ore is a rock that has a high amount of iron. Ores are processed to separate the desired mineral from the other materials in the rock. The processing method varies based on the minerals in the ore.

Minerals form by various processes and from different chemical building blocks. Therefore, mineral resources are unevenly distributed on Earth. The location of mineral deposits depends on the processes by which the minerals and deposits formed. For example, metals such as gold and silver are commonly found in and nearby intrusive igneous rock. These deposits form when hot fluids carrying dissolved metals escape from cooling magma, or molten rock, inside Earth. As the fluids cool and the dissolved substances solidify, the metals are deposited in the surrounding rock.

Some geologic processes change existing minerals into new minerals. These processes include dissolution, evaporation, and contact with molten rock. Other geologic processes, such as erosion by wind or water and uplift by tectonic plate movements, can move mineral deposits to new places.

Mineral Deposits in North America

Minerals are unevenly distributed across North America.

Gold is found in and around intrusive igneous rocks below ground, or above ground where it has been uplifted by geologic processes. Some gold is also found in stream bottoms.

Most iron ore is found where oceans existed millions of years ago. Limonite is one type of iron ore mined today.

Table salt is made from a mineral called *halite*. It forms when salt water evaporates. Halite is forming today in the Great Salt Lake in Utah and in other places around the globe.

EVIDENCE NOTEBOOK

7. How can gold deposits form? How could gold be moved from its original location to a new location? Record your evidence.

Freshwater Resources

Humans use fresh water for drinking water, agriculture, and manufacturing processes, including the generation of electrical energy. However, the supply of fresh water is limited and unevenly distributed around Earth. Only about 2.5% of Earth's water is fresh water. And much of that fresh water is frozen in glaciers and icecaps.

Fresh surface water is distributed based on both past and present Earth processes, such as climate patterns and the shape of the land. For example, landforms such as mountains and valleys form slowly by geologic processes. The locations of freshwater resources depend on where the ground surface was uplifted, how the ground was eroded to form valleys or depressions, and how sediment was deposited in basins and plains. After heavy rains, water flows downhill through valleys to form streams and rivers. Eventually, some of the flowing water collects in depressions to form ponds or lakes, and some enters the ocean and becomes salt water.

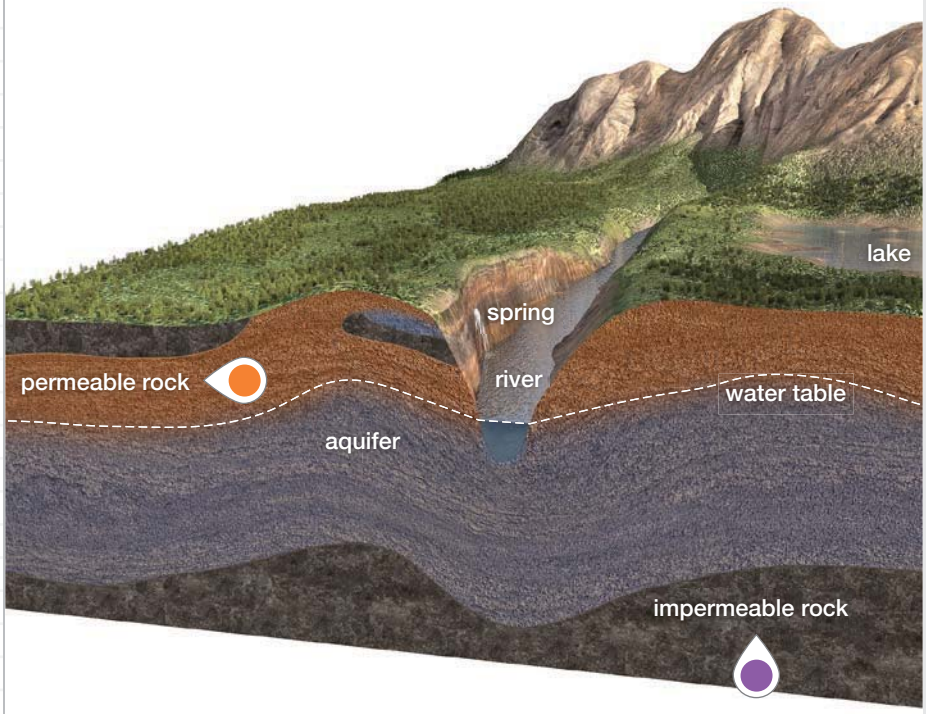
Climate and latitude also affect the distribution of fresh water on Earth's surface. At both of Earth's poles, large amounts of fresh water are stored as ice in icecaps and sea ice. In polar regions, some water is also stored as ice in frozen soil called *permafrost*. At high elevations, fresh water may also be stored as glaciers or permanent snowpacks. In dry, desert regions, surface water is rare because it quickly evaporates into the dry air.

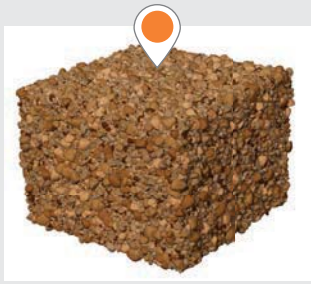
Some fresh water exists underground, because some water seeps down into soil and rock and fills small spaces in these materials. This water is known as *groundwater*. Groundwater is stored in layers of rock called *aquifers*. Aquifers exist beneath the surface almost everywhere on Earth, including under mountains, plains, forests, and even deserts. Groundwater can flow hundreds of miles under the surface through an aquifer and then rise to the surface at a distant location. So, groundwater may flow under the driest desert, and it may reach the surface at a spring, oasis, or well.

The Huacachina Oasis near Ica, Peru, formed in the desert where groundwater rises to Earth's surface.

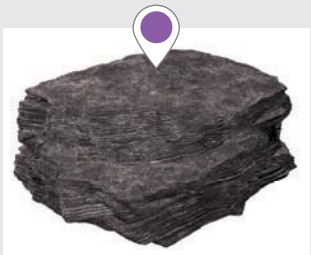
Groundwater and Surface Water Distribution

Aquifers are found in many places on Earth. Aquifers are connected to surface water in springs, lakes, streams, and rivers. Water can flow back and forth between these reservoirs.





Aquifers consist of permeable rocks that hold groundwater. Like a sponge, permeable rocks allow liquid or gas to pass into and through them.



Water and other fluids cannot flow through impermeable rock. Impermeable layers prevent groundwater from entering or leaving aquifers.

Groundwater is not always accessible from the surface because the types of rocks that the water collects in and flows through are unevenly distributed within Earth's crust. Water flows through pore spaces and cracks in permeable rocks. Impermeable rocks do not allow water to flow through and act as barriers to the movement of groundwater.

Both surface water and groundwater resources are replenished as part of the water cycle. As rain falls or snow and ice melt, the water flows over Earth's surface and seeps into the ground. The process by which water enters an aquifer is called *recharge*. Groundwater collects and flows through rock layers very slowly. So, the time it takes to recharge an aquifer can vary from a few hours to thousands of years.

Locate Oil

8. Use words from the word bank to complete the passage.
A geologist looks for a new place to drill for oil. She knows the remains of _____ organisms formed oil and finds areas that were once ancient _____. She uses special equipment that can show data about rock beneath the surface to tell if there is _____ rock that might hold oil.

WORD BANK

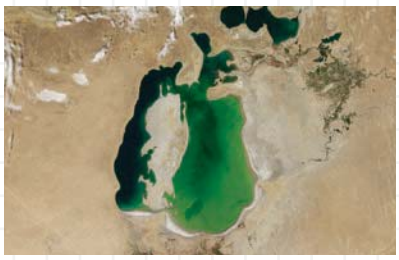
- sea floors
- marine
- volcanoes
- land
- impermeable
- permeable

Explaining Human Impact on Natural Resource Distribution

As humans use more resources, the availability of these resources may be reduced. Once nonrenewable resources, such as oil and coal, are used up, it is unlikely more will become available because these resources take millions of years to form. Other resources, such as water and wind, are renewable resources. People can conserve renewable resources such as trees or biomass by careful management and use.

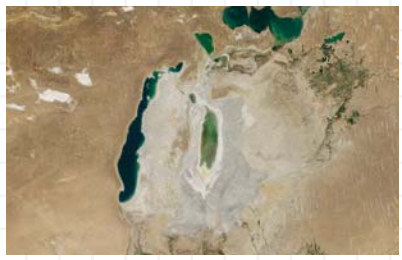
The Shrinking Aral Sea

Before 1960, the Aral Sea in Central Asia was the world's fourth largest lake. It supported villages and a small fishing industry. Then, people began using the water to irrigate crops. The sea shrank. The water became polluted with fertilizer. In 2000, the Aral Sea was less than half its historic size. By 2016, it had almost dried up.



2000

2008



2016

9. What do you think the Aral Sea will look like in 2024? Support your claim with evidence and reasoning.

Human Impact on Soil Distribution

Human actions affect the distribution of soil. Human actions can negatively change soil quality and can promote erosion. Soil polluted with pesticides and fertilizers is not a valuable resource. Repeatedly growing nutrient-depleting crops in the same fields can also lead to unhealthy soil. Unhealthy soil is less able to support plant growth, and its value as a resource is reduced. Strip mining, overgrazing cattle, and clearing forestland for building encourage soil erosion and can cause the loss of healthy soil. These processes may contribute to the expansion of deserts, a process called *desertification*. To protect soil resources, human activities can be designed to prevent soil loss or degradation. Planting diverse crops, rotating crops, planting trees and cover crops, and contour farming help prevent erosion and degradation of soil.

Human Activities and Soil Erosion

For years, Great Plains farmers over-plowed and overgrazed the land. In 1931, drought and poor farming practices caused extensive soil erosion. These practices caused the Dust Bowl.

Loss of tree cover increases soil erosion. Humans did not form the Sahara desert. But human activity, such as removing trees, allows the Sahara to grow. This is an example of desertification.

Crop rotation and contour plowing enrich soil and prevent erosion. Adding mulch retains water. Planting ground cover and trees holds soil in place. These practices protect soil resources.

10. Can human activities change the distribution of nonrenewable resources, such as oil or minerals? Could we change the distribution of renewable resources, such as sunlight and wind? Support your claim with evidence and reasoning.

Engineer It

Reduce Erosion

Soil erosion caused by heavy rains is threatening to reduce the harvests of farms in your hilly community. Work with a small group to develop a solution to reduce erosion.

11. Identify the criteria and constraints for your problem. What needs must your solution address? What resources do you need to implement your solution? Describe any issues that limit your solutions.

12. **Discuss** Brainstorm and list ideas to prevent soil erosion. Be sure to consider the criteria and constraints. Choose the most promising solution based on your criteria and constraints.

Human Impact on Energy and Mineral Resources

Before humans can use minerals and fossil fuels, these resources must first be extracted from the ground. Extracting resources changes their distribution because the resources are removed and carried to a new location. For example, when oil is pumped out of the ground for human use, the amount of oil in that reservoir is reduced or completely depleted. Once nonrenewable energy and mineral resources are used, they are not replaced for millions of years. As humans extract and use nonrenewable mineral and energy resources, the total amount of these resources available for future use declines.

As deposits and reservoirs get smaller and disappear, we must find new deposits of the resources to use. These new deposits may be of lower quality or may be more challenging to acquire than the original deposits. We may also develop new technologies for extracting valuable resources. Some nonrenewable resources can be recycled. For example, gold can be extracted from some existing products, such as jewelry, and used again in other products, such as electronics. Recycling mineral resources reduces the need for mining and processing new ore deposits. Managing and reducing the use of nonrenewable minerals and fossil fuels is important to ensure that resources will remain available for future generations.

Gold Mining and Distribution

In 1848, gold was discovered at Sutter's Mill in California. Thousands of people moved to California to look for gold in the streams and hills of California in the years that followed.

Gold deposits are located in these mountains in Peru and on every continent. Some gold deposits are deep inside Earth, and others are at or near the surface.

Valuable gold deposits are rare. As gold is taken from a mine, less and less gold remains in that location. As the supply of gold at the mine gets smaller, miners must ask: Is there enough gold to continue mining this location?

Although some deposits have been depleted, the demand for gold continues. Used gold can be reclaimed and recycled. Recycling gold becomes more important as accessible and minable gold deposits become harder to find.

EVIDENCE NOTEBOOK

13. How does human activity change the distribution of gold? Record your evidence.

Human Impact on Freshwater Distribution

Humans cannot control Earth's water cycle, but they do change the distribution of fresh water on Earth. Humans cannot live without fresh water. We use water in most activities, including drinking and bathing, raising livestock and crops for food, manufacturing goods, and generating electrical energy.

Human activities can change the distribution of surface water. Dams block off flowing water to form reservoirs. As a result, water that would have flowed farther down the river stays in the area above the dam. Dams make more fresh water available upstream from the dam, but they make fresh water less available downstream. Humans also build canals to force water to flow in different directions. Canals are used to transport fresh water into and through regions where natural streams and rivers do not exist. Canals are also used to transport other materials by boat. Reservoirs and dams in dry areas also increase the rate of evaporation of freshwater supplies.

Humans extract groundwater from aquifers by using wells to pump the water up from below the surface. This process, called withdrawal, reduces the amount of water in the aquifer. In some places, water is used up faster than it is replenished by precipitation. The process by which water seeps through the ground and enters an aquifer is called *recharge*. When the rate of withdrawal exceeds the recharge rate, the water level in the aquifer may drop, and deeper wells have to be drilled. Over time, an aquifer can be completely drained if the rates of use and recharge remain unbalanced. Removal of too much groundwater may also destabilize the ground and cause sinkholes to form.

This canal diverts fresh water through the Arizona desert. These canals provide water for irrigation, industry, and personal use in an area that has few natural freshwater resources.

Hands-On Lab

Model Recharge and Withdrawal in an Aquifer

You will model an aquifer to explore how groundwater levels change.

MATERIALS

- fish tank hand siphon, pump, or syringe
- food coloring, blue
- graduated cylinders, 50 mL (2)
- gravel or aquarium pebbles, light colored, (3 cups)
- pitcher, with water
- plastic container, clear, large, rectangular
- ruler

Procedure

STEP 1 Build a landscape made up of permeable rock. In your landscape, make a depression to represent a low-lying area of land. What material models the permeable rock?

STEP 2 Add a few drops of blue food coloring to the pitcher of water to make the water a medium blue color. Carefully pour the blue water over your landscape until it partially fills the depression you made. What do the blue water and the depression represent?

STEP 3 Use a ruler to measure the height of the groundwater starting from the bottom of the container. Measure the height of the water in the depression starting from the bottom of the depression. Record your observations in the table.

STEP 4 Using a pump, model how a well can be used to withdraw groundwater from an aquifer. Pump out 50 mL of groundwater. Measure and record the depth of the groundwater and the surface water in the depression. Record your observations in the table.

STEP 5 An aquifer is refilled when precipitation occurs. Add 50 mL of water to the aquifer. Measure and record the depth of the groundwater and the surface water in the depression. Record your observations in the table.

	Groundwater depth (mm)	Surface water depth (mm)	Observations
STEP 3			
STEP 4			
STEP 5			

STEP 6 How do precipitation and pumping each affect the water in an aquifer? How do changes in the groundwater level affect the level of surface water?

STEP 7 How could you model the effects of humans using water from the aquifer more quickly than precipitation could recharge the aquifer?

STEP 8 In your model, you withdrew and added water in seconds. Explain how this differs from the rate at which groundwater levels change in the real world.

Do the Math
Analyze Groundwater Use

Caleb's farm uses groundwater from an aquifer that holds 100,000 gallons of water. The farm withdraws about 5,000 gallons per month. Precipitation adds about 2,000 gallons of water per month back into the aquifer.

14. Use the variables to write an equation to represent the overall change in volume per month, taking into account both withdrawal and recharge. Next use your equation to find the overall change in volume each month. Hint: For the rate of withdrawal, use a negative value.

- ***v*** = overall change in volume in one month
- ***s*** = starting volume
- ***w*** = withdrawal rate
- ***r*** = recharge rate

15. What will the total volume of water in the aquifer be after 6 months? Recall the initial volume is 100,000 gallons.

16. The well only reaches a certain depth into the aquifer. Once the aquifer's volume is less than 50,000 gallons, the well will no longer be able to pump water. At the current rate of usage, how long will this take?

Continue Your Exploration

Name: **Date:**

Check out the path below or go online to choose one of the other paths shown.

Rare Earth Elements and Technology

- **Hands-On Labs**
- **Resources in Space**
- **Propose Your Own Path**

Go online to choose one of these other paths.

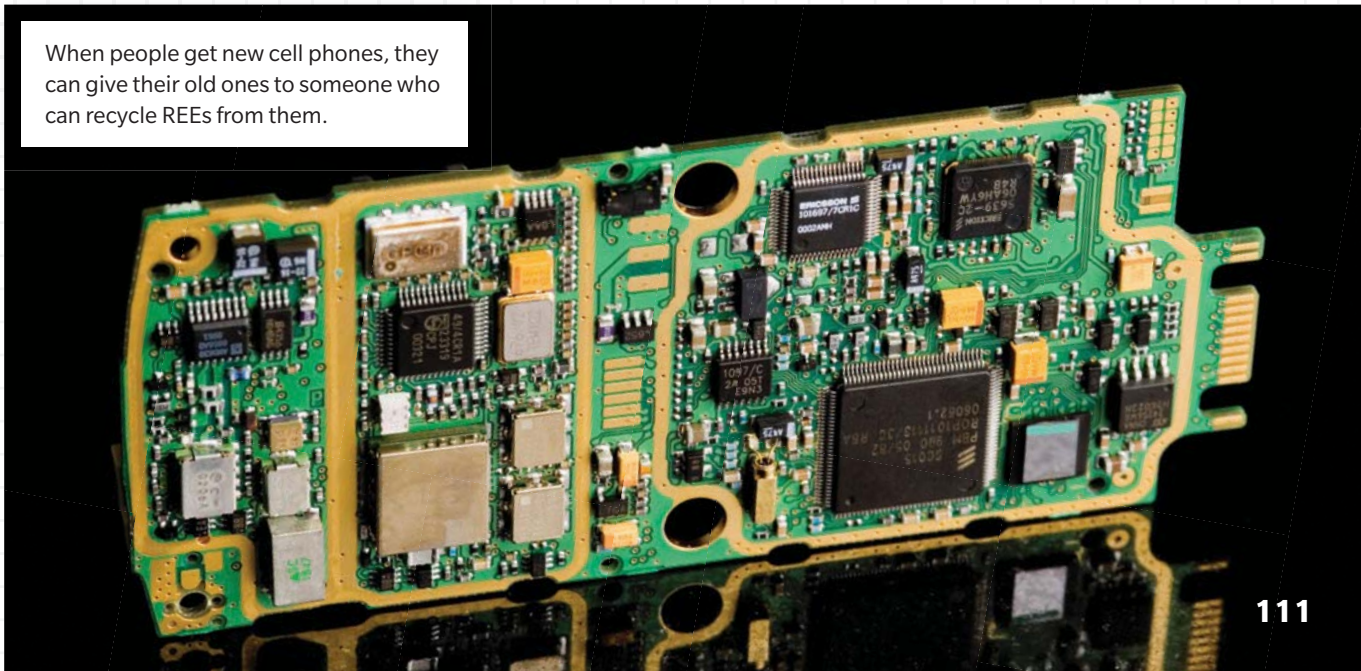
Suppose you send a text message. For you, it means tapping keys. For Earth, it means more rare earth elements (REEs) in shorter supply. Seventeen elements are considered REEs, and most are elements few people recognize, such as neodymium or terbium. Without them, cell phones, televisions, and all forms of state-of-the-art electronics would not work.

There are many uses for REEs. They are used to make rechargeable batteries and the world's strongest magnets. They are used to make light bulbs that give off more light for longer periods of time and to make images on television screens clear and bright. REEs are also used to reduce the amount of toxic emissions in automobile exhaust.

Extracting and Processing REEs

REEs are nonrenewable resources, and less than 1% are recycled. The demand for REEs increases daily as demand increases for technology. Scientists and engineers are trying to answer several questions about REEs. How many more REE deposits exist on Earth? Can other elements be substituted for REEs? Because REEs are nonrenewable, what will happen to technologies that depend on REEs if they are used up?

REEs accumulated on Earth as the planet was forming, so they are found deep below the surface. As a result, mining REE deposits with currently available tools and technology is difficult and costly.



When people get new cell phones, they can give their old ones to someone who can recycle REEs from them.

Continue Your Exploration

In the geosphere, REEs combine with other elements to form chemical compounds. Most REE compounds form as crystals. Processing REEs means separating the elements from the compounds in which they are found. The cost of processing REEs makes them expensive to use. The waste from these processes includes radioactive material and toxic chemicals. Disposal of the waste can endanger the environment, so safe disposal also adds to the cost of using REEs.

Because REEs have so many applications, we will eventually use up all of the REEs in the geosphere. Recycling REEs is critical to maintaining supplies. Most products contain very small amounts of REEs. The average television has trace amounts of yttrium, europium, and terbium. Cell phones may have lanthanum and neodymium. Even at trace amounts, recycling is worthwhile. However, recycling means collecting each REE individually from thousands of cell phones, laptops, and televisions.

1. What are some ways we could ensure that rare earth elements are used wisely? Circle all that apply.

A. require recycling of used electronics

B. eliminate their use in electronics

C. develop ways to use less REEs per device

D. replace REEs with common elements

E. make electronics that last longer

2. As REEs are used up and the available supply goes down, do you think the cost of electronics, such as cell phones, will go up or down? Support your claim with evidence and reasoning.

3. What is a possible way to increase the supply of REEs other than recycling?

4. Collaborate With a partner, discuss ways to increase the number of people who recycle electronic products. Choose the idea that you think would work best and present it to the class.

Can You Explain It?

Name: **Date:**

What determines where gold is found in nature?

EVIDENCE NOTEBOOK

Refer to the notes in your Evidence Notebook to help you construct an explanation about where gold is found in nature.

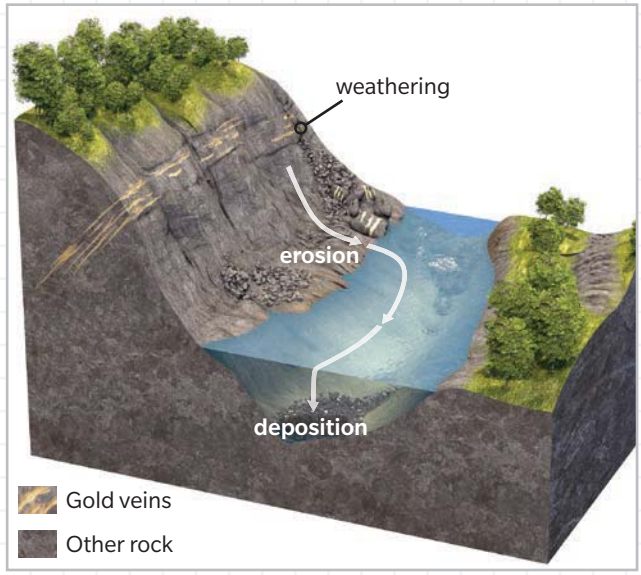
1. State your claim. Make sure your claim fully explains what determines where gold is located in nature. Explain whether natural processes, human activities, or both have an impact on these places.

2. Summarize the evidence you have gathered to support your claim and explain your reasoning.

Checkpoints

Answer the following questions to check your understanding of the lesson.

Use the diagram to answer Questions 3–4.



3. Number the statements to show the correct order of the processes displayed in the diagram.

____ Weathered bits of the gold are eroded by water.

____ Gold particles are deposited as they sink into depressions in the stream.

____ Gold ore forms as magma cools beneath the surface.

____ The gold ore is exposed to the surface and weathered.

4. Which of these processes is currently redistributing gold in the area in the diagram? Select all that apply.

A. evaporation of water

B. weathering

C. cooling magma

D. erosion

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5. Which of these activities or processes might affect the supply of groundwater in an aquifer? Select all that apply.

A. raising livestock on a farm

B. processing materials in a factory

C. drought

D. excessive rainfall

Use the table to answer Question 6.

6. Almost all of the diamonds on Earth formed billions of years ago in Earth's mantle. The diamonds were brought to the surface by volcanic eruptions. Over time, the volcanic rocks eroded and the diamonds were deposited in sediments. What can you infer about the geologic processes that shaped Russia and Africa from the table?

A. Russia has more active volcanoes than Africa does.

B. Both Russia and Africa only recently formed as continents.

C. Both Russia and Africa had volcanic eruptions in the past.

D. More weathering and erosion happens in Russia than in Africa.

Top Gem Diamond Producers in 2015

Country and continent	Amount of diamond produced (millions of carats)
Russia (Asia)	21.5
Botswana, Angola, South Africa, DR Congo, Namibia (Africa)	35.5
Canada (North America)	12.0
All other countries	2.4

Source: Donald W. Olson, USGS, *Mineral Commodity Summaries*, 2015

Interactive Review

Complete this section to review the main concepts of the lesson.

The distribution of resources, such as minerals, soil, fossil fuels, and water, depends on both past and current geologic processes.

A. Explain why the distribution of mineral and freshwater resources is uneven in the Earth system.

As humans use nonrenewable resources, the distribution of those resources changes, and their availability becomes limited. Human activities can also affect the quality of some resources, such as water and soil.

B. Describe the cause-and-effect relationship between human use of a nonrenewable resource and the distribution of that resource on Earth.