Earth's Natural Resources and Human Impacts

Designed to meet South Carolina Department of Education 2005 Science Academic Standards

Department of Natural Resources

South Carolina Geological Survey

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Earth's Natural Resources

Standard 3-3.7: Exemplify Earth materials that are used as fuel, as a resource for building materials, and as a medium for growing plants

The Earth is rich in natural resources that we use everyday. These resources are any valuable material of geologic origin that can be extracted from the earth.

- **Energy resources:** A major natural resource that all Americans rely on is petroleum fuel (oil or natural gas). Petroleum is an earth material that forms within the Earth and can be burned to produce heat and electricity or made into gasoline. Other fuels are coal, uranium, and alternative energy (wind, tidal, solar).

- **Nonmetallic resources:** Another natural resource that is very important to us is rock. We depend on sandstone, granite and other types of bedrock formed within and on the Earth to build our schools, homes, and skyscrapers. We use the mineral calcite as a main ingredient in cement and red clay to make bricks. We use sand, gravel gypsum and sulfur in everyday items. Soil is yet another natural resource that is necessary to support all plant life on Earth.

- **Metallic resources:** Iron, copper, aluminum, lead, zinc, gold, silver and many more are considered valuable resources that are vital for our modern society.

Aluminum

Copper

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Common uses of Earth's Resources

- Common uses of natural resources are everywhere. It is nearly impossible to cease consuming natural or geologic resources altogether. Here are just a few examples of things you commonly use, but probably don't think about:

- ✓ A pencil uses zinc and copper (to make the brass), petroleum for the eraser, iron (in the machinery to make the pencil), pigments, clay and graphite. The only renewable resource in your pencil is the wood!

- ✓ Your jeans, although they may be almost all cotton, are usually blended with petroleum-based synthetic fibers to cut down on shrinking
- ✓ The zipper on those same jeans is made out of copper and zinc.
- ✓ The dye in all your fabrics come from petroleum

- ✓ Eyeglasses and windows are made of quartz sand and petroleum
- ✓ Dental fillings are made of mercury and silver
- ✓ Videotapes are made of vinyl and iron and chromium

Nonrenewable vs. Renewable Resources

Standard 7-4.6: Classify resources as renewable or nonrenewable and explain the implications of their depletion and the importance of conservation.

- Natural resources that can be replaced and reused by nature are termed renewable. Natural resources that cannot be replaced are termed nonrenewable.
- Renewable resources are replaced through natural processes at a rate that is equal to or greater than the rate at which they are used, and depletion is usually not a worry. Some common examples include:
    - Air (wind)
    - Fresh water
    - Soil
    - Living organisms (trees)
    - Sunlight

Trees: A renewable resource

Nonrenewable resources are exhaustible and are extracted faster than the rate at which they formed. Some common examples are:

- Fossil fuels (coal, oil, natural gas)
- Diamonds and other precious gems and minerals
- Types of metals and ores

★ ***Important:*** **Nonrenewable resources such as these exist in a fixed amount and can only be replaced by processes that take millions of years. If they are depleted, they are depleted for good.**

Oil: A nonrenewable resource

Nonrenewable vs. Renewable Resources

- Sometimes, however, renewable resources can be depleted if they are used too fast! Here are a few examples of how this can happen:

- If an area undergoes severe deforestation and the soil erodes quickly, this will deplete the land of fertile topsoil needed to support plant growth, so trees and shrubs cannot grow back.

- If trees and vegetation are removed without being replanted, this can have effects on the land, air, and water. Common effects include runoff and water quality.

- While fresh water is a renewable resource, in some areas, overpopulation and increased demand on the water supply, lack of water conservation practices, and pollution of the water source can cause water to become scarce. This is especially a big problem in cities situated in dry areas. A decrease in water availability can affect agriculture, farmland, livestock, and other living organisms (including humans) in the area.

Humans and Conservation

Standard 5-3.6: Explain how human activity (including conservation efforts and pollution) has affected the land and oceans of the Earth.

- Because of the severe impact that we impose on the land, air, and water, conservation has become increasingly important.
- **Conservation** is using natural resources wisely and not contributing to pollution of the land, air or water. Human activities can benefit the environment and help preserve resources.
- Conservation can include small-scale clean-up projects along roadways or building fences to prevent dune erosion to large-scale beach renourishment. Planting trees is another way to support conservation as trees are too often removed without being replanted.
- The phrase "Reduce, Reuse, and Recycle" has been a catch phrase of the late 20th and early 21st centuries.

Reduce: Don't use a resource if there is an alternative (walking vs. driving)

Reuse: Use a resource again without changing it or reprocessing it: Use glassware as opposed to paper plates and styrofoam

Recycle: Reprocess a resource so that the materials can be used in another item. People can recycle just about anything from cardboard to old shoes!

and

Protect: Prevent the loss of a resource (wildlife) by managing its environment. Rapid deforestation can wipe out both animals and plant life. By controlling the environment, we can control the resources.

Humans and Pollution

- Unfortunately, humans have done more harm than good over the past 50 years by contributing extreme amounts of pollution into Earth's atmosphere, land, and water ways. **<u>Pollution</u>** is anything that harms or degrades the natural environment.

- **Water:** The ocean supplies billions of living organisms and animals with nourishment and is a sensitive ecosystem that can be polluted very easily. Oil spills, such as the Exxon Juan-Valdez spill in 1989, can upset this delicate balance for decades to centuries. The wetlands and salt marshes are also home to protected species and are susceptible to the affects of pollution. It is easy to forget that all streams flow to the oceans. People dumping trash in a mountains stream can affect plants and animals (and humans!) at the coast hundreds of miles away.

Water Pollution

- **Land:** Landfills occur all over the U.S., and contaminants in the landfill can leach into the nearby soils and groundwater, contaminating the ground we walk on and the water we drink. Reservoirs and dams retain valuable sediment that would otherwise make it to the coast, resulting in coastal erosion. They also prohibit fish migration upstream and downstream.

Land Pollution

- **Atmosphere:** We pollute the atmosphere mainly by burning fossil fuels. This produces greater than 10 times the amount of greenhouse gases that make it to the atmosphere through natural processes. The industrial revolution sparked the rise in man-made air pollution and as a result, the world is now counting it's "emission points." Pollution also comes from agriculture (animal waste), construction, and mining.

Air Pollution

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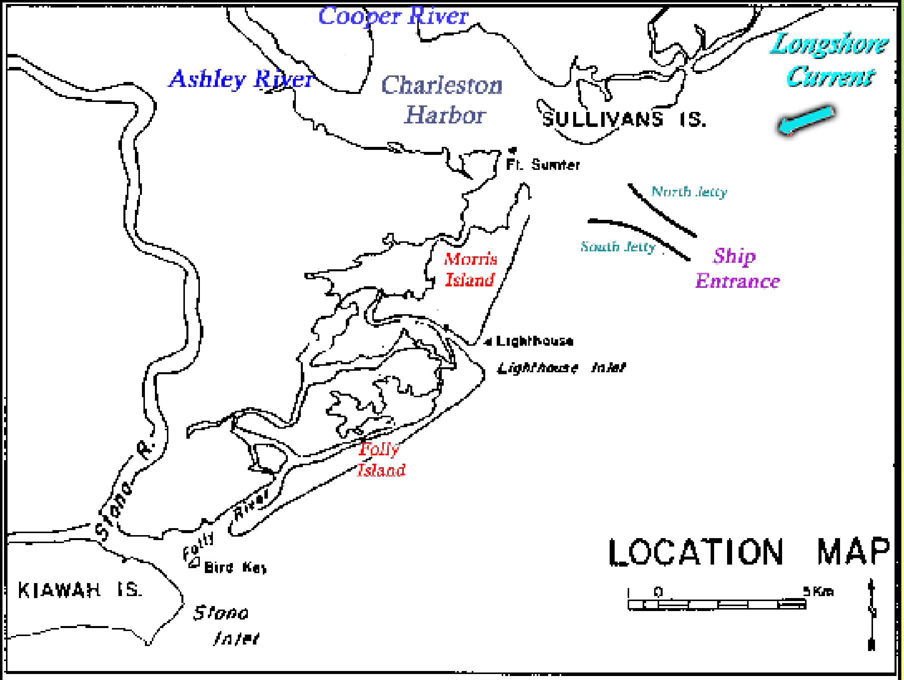
Humans vs. the coast: A South Carolina example

- Humans have also negatively impacted the earth and earth processes in other ways, especially in sensitive coastal regions. Over a decade ago, engineers noticed that if they built a wall, also known as a jetty or groin, perpendicular to the shoreline, sand would be trapped on the upstream end and the beach would grow! This was wonderful for property owners and beach-goers alike. The engineers believed they were contributing to the conservation of beaches; however, they did not think about the severe erosion it caused on the downstream side.

- In the late 19th century, Charleston Harbor, a busy shipping port in South Carolina, started to fill up with large amounts of sediment from the rivers and the sea. Engineers designed a large wall on either side of the shipping passage to keep the sediment out of the shipping channel, thereby keeping it at the same depth.

- In order to prevent sand from collecting in the shipping channel and the harbor, the Charleston Harbor Jetties, were constructed in 1898. The structures extend for 2.5 to 3 miles in length from Sullivan's Island and Morris Island.

- The engineers did not realize that when coastal structures are constructed in the sandy nearshore, they alter the natural movements of beach sediments and cause erosion. The modification upsets the natural equilibrium of sediment and the shoreline configuration changes in response to this imbalance.



Map of Charleston Harbor

Image modified from SC Dept. of Natural Resources, Geological Survey publication, "A Compendium of Field Trips of South Carolina Geology"

▪ For 25 years after construction, no erosion was seen on Folly or Morris Islands, and the beaches actually grew due to sand bars moving onshore by wave action. Within 30 years, however, the growth of Morris and Folly Island contributed to the demise of Charleston's delta, the source of sediment for Morris and Folly Islands, which receives its sediment via longshore currents from upstream rivers.

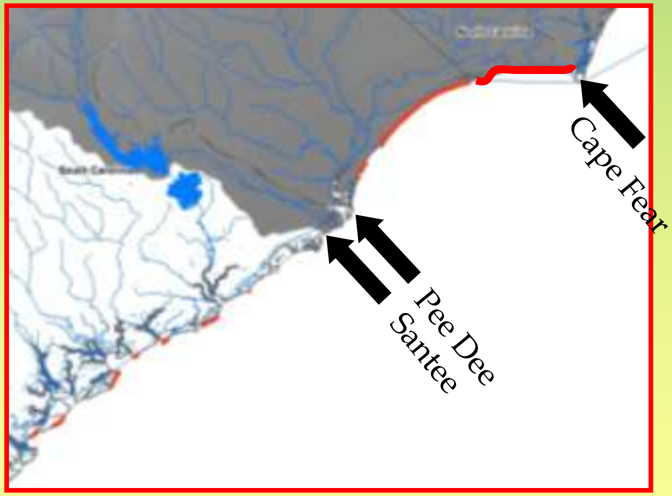
http://www.cofc.edu/CGOInquiry/human.htm

▪ By the 1930's, the sediment supply from the Charleston delta was depleted and Folly and Morris Islands began to experience erosional rates of approximately 4-6 feet per year.

▪ As a direct result, the Morris Island Lighthouse, once situated 1300 feet inland, is now located over two thousand feet in the ocean!

▪ South Carolina has the 3rd highest rate of coastal erosion in the U.S. While hard engineering structures contribute to beach loss, large storms, sea-level variation, sand dredging, and sediment starvation by upstream dams are other factors that affect our coast.

▪ The southeast Atlantic coast has undergone episodes of erosion and subsequent artificial **beach nourishment** over the past few decades. Sand that has been added through beach nourishment episodes is greater than **100 million cubic yards.** Enough to fill over 21,000 football fields 1 foot high!



Beach nourishment project locations in S.C. highlighted in red. Beach nourishment is considered a method of conservation.

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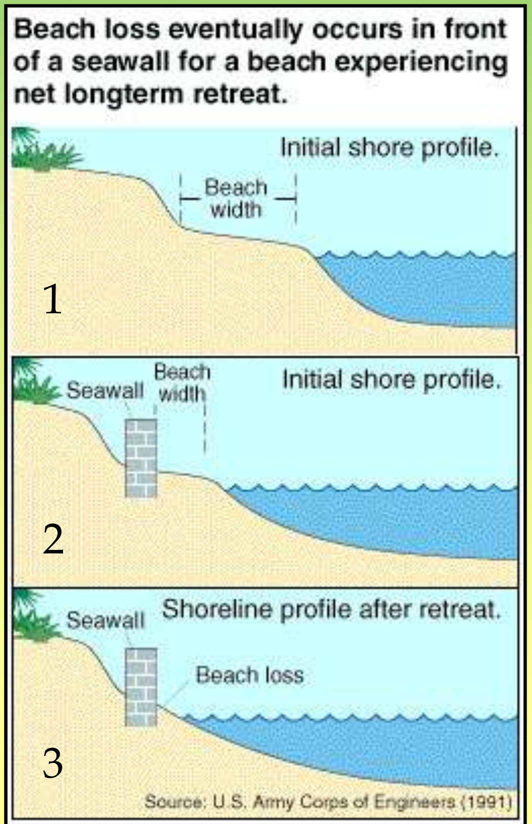
▪ Hard engineered structures called groins are similar to jetties. Groins, though outlawed now in most states, were also constructed at the time of the Charleston jetty construction and in 1950, the spacing of groins along the coast was increased to every 500 feet. These also contributed to the massive rates of erosion to the adjacent barrier islands.

▪ Seawalls are another type of coastal engineering structure used to protect property directly behind it; however, due to the partial reflection of the incoming wave, the sediment in front of the wall is scoured and removed, thus facilitating erosion.

http://www.cofc.edu/CGOInquiry/human.htm

Groins along the SC shoreline



Steps showing the erosive processes brought about by sea wall construction, which can be seen on Folly Island. Beaches can rebuild themselves; however, if a sea wall is present, they will continue eroding.

Seawall in front of Holiday Inn, Folly Beach

▪ Over the past 150 years, Folly Beach has, at times, retreated at rates of up to 10 feet per year.

http://www.cofc.edu/CGOInquiry/human.htm

The Conservation Movement

- "The **conservation movement** is a political, social and, to some extent, scientific movement that seeks to protect natural resources including plant and animal species as well as their habitat for the future." *Source:* [*http://en.wikipedia.org/wiki/Conservation_movement*](http://en.wikipedia.org/wiki/Conservation_movement)

- "The early conservation movement included fisheries and wildlife management, water, soil conservation and sustainable forestry. The contemporary conservation movement has broadened from the early movement's emphasis on use of sustainable yield of natural resources and preservation of wilderness areas to include preservation of biodiversity. "*http://en.wikipedia.org/wiki/Conservation_movement*

- The United States Department of Agriculture (USDA) runs the Natural Resources Conservation Service (NRCS). They're committed to "helping people help the land."

- Since 1935, the NRCS (originally called the Soil Conservation Service) has provided leadership in a partnership effort to help America's private land owners and managers conserve their soil, water, and other natural resources.

http://photogallery.nrcs.usda.gov/Index.asp

- NRCS employees provide technical assistance based on sound science and suited to a customer's specific needs. They also provide financial assistance for many conservation activities. More information can be found at [*http://www.nrcs.usda.gov/programs/*](http://www.nrcs.usda.gov/programs/).

- In South Carolina, the Department of Natural Resources (SCDNR) is committed to conservation efforts within the state. More information can be found at [*http://www.dnr.sc.gov/conservation.html*](http://www.dnr.sc.gov/conservation.html)

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Conservation = Recycling

One of the ways that everybody can help with the conservation effort is by recycling. The following information was taken from http://www.recycle.com/faqs.html.

- "Recycling has really been around for perhaps thousands of years! For example, ancient cultures that began making metal products, could melt down old broken items like pots or swords and make new ones. More recently, during World War I and II, people would have paper drives and metal drives to collect materials for the war effort. Nothing was wasted! When landfilling became a cheap way to dispose of trash in the 1940's and 1950's, recycling was less popular. But modern recycling of glass, paper, cans, became more popular again in the 1970's with drop-off recycling centers, and in the late 1980's and 1990's with curbside collection. Mother nature is, of course, the ultimate recycler... without the natural decay or composting process, we'd all be covered in leaves and other dead organic matter."

- "Recycling helps the environment by slowing down the rate at which we have to burn garbage or put it in landfills. With fewer landfills we can have more space for people to farm, live, and work. Recycling also helps by reducing our need to consume fresh natural resources to make new products. As a result we can save these resources for use by future generations. Most importantly, recycling saves energy and reduces pollution. This could help slow down global climate change, another environmental problem caused by burning fossil fuels like oil and gas."

Thousands of aluminum cans, ready for recycling

▪ “Clothes that you have outgrown can be "reused" by donating them to charities. Aluminum cans are nearly as easy. They need only be sorted and cleaned. Special recycling facilities then melt them down and make new cans. “

▪ “Some consumer products such as tennis shoes or even milk cartons are more difficult to recycle because they are made from multiple types of materials. Shoes contain many different types of plastics for example, and milk cartons contain a plastic-coated paper, and sometimes metal foil. Generally, in the recycling process these materials must be physically separated before things like plastic can be recycled into new products. Sometimes, however, this process is expensive. “

▪ “Participation in recycling programs reached a new peak in the 1990's as most communities in the United States started up curbside or drop-off recycling programs. Now, many of these communities are evaluating their programs to see what additional materials can be collected. For example, the City of Ann Arbor, Michigan now collects 30 different materials in its curbside program, including paperback novels, milk cartons, textiles (clothing), shoes and other household items.”

Ores, Minerals and Fossil Fuels

Standard 8-3.5: Summarize the importance of minerals, ores, and fossil fuels as Earth resources on the basis of their physical and chemical properties

Earth's resources have properties that make them important and useful. The two properties are:

1. Physical property: Hardness, luster, color, texture, cleavage, and density (*see section on Minerals)*
2. Chemical property: Ability to burn or reactivity to acid.

Three of the most common earth resources that have importance on the basis of these properties are:

1. Minerals: Natural, solid materials found on Earth that are the building blocks of rocks. Each has a chemical makeup and set of properties that determine value and use (quartz, sapphires, talc, gypsum).
2. Ores: Minerals that are mined because they contain useful metals or nonmetals (iron, copper).
3. Fossil Fuels: Natural fuels that come from the remains of living things. Fuel gives off energy when burned (coal, peat, petroleum).

Introduction:

Problems with our energy sources and supply (i.e. pollution, foreign oil) have become an important conservational and political topics over the past 25 years. Alternate energy sources such as wind, water, and solar have been investigated, but only a fraction of the U.S.'s energy comes from these alternate sources.

Fossil Fuels

1. What is a Fossil Fuel?

Because coal, oil, and natural gas form from ancient organic matter, they are called fossil fuels.

Coal is actually a sedimentary rock that was originally formed from ancient plant matter through decomposition and millions of years of compaction. Coal, made of carbon, is by far the most abundant fossil fuel in the world. The eastern and midwestern U.S. have abundant coal seams that formed during the Pennsylvanian Period (300 ma), when the region was located close to the equator.

Petroleum: A broad term that includes both crude oil and natural gas. **Crude oil** is a thick, black liquid mixture of naturally occurring hydrocarbons (compounds containing hydrogen and carbon) that forms from the buried remains of marine organisms. **Natural gas** forms under similar conditions but is in a gaseous state. These two products form the bulk of the U.S.'s energy consumptions:

Oil	Natural Gas	Coal	Nuclear	Hydroelectric	Biomass	Geothermal, wind, solar and other
39.4%	23.6%	22.7%	8.3%	2.7%	2.8%	0.5%

The United States' energy consumption resources as of 2007

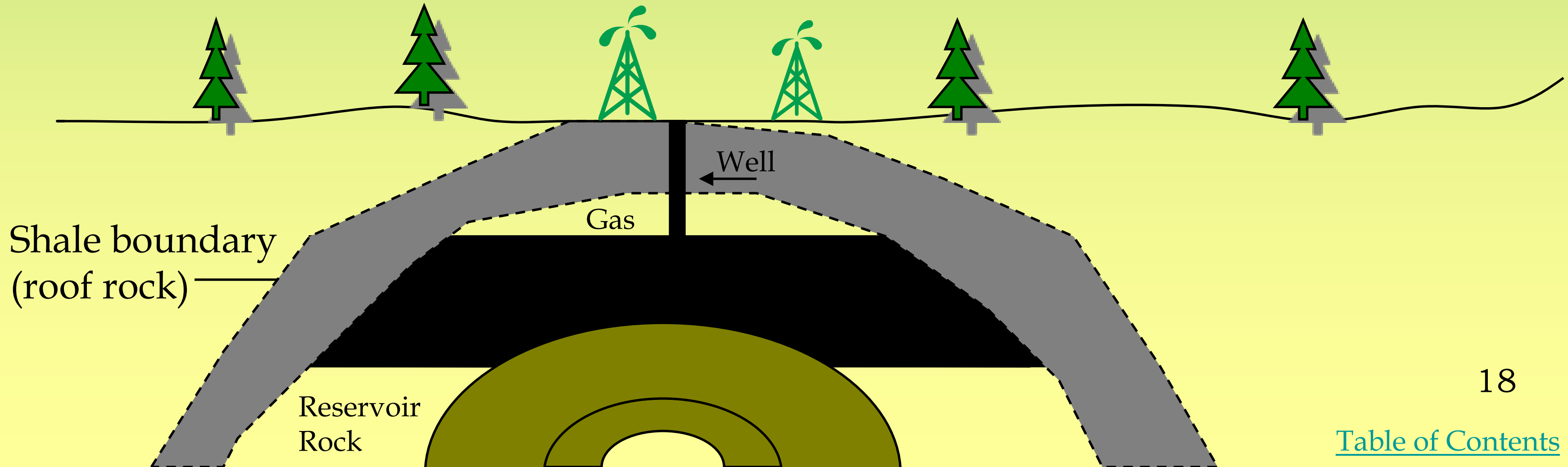
2. How do fossil fuels form?

▪ Although we know that fossil fuels form from the decomposed remains of past life over millions of years, large amounts of pressure and high temperatures are also necessary. As marine organisms, called plankton, die and fall to the seafloor, they are covered by sediment. After they are buried deeply enough, pressure and heat cause the dead plankton to change to oil and gas.

3. How can we find fossil fuel?

▪ There are specific but known conditions that must be met in order to find the oil and gas. Oil and gas are usually found within a permeable rock such as sandstone. Permeable simply means that the rock is porous, and liquids or gases can easily flow through it.

▪ A finer grained sedimentary rock, like shale, is relatively impermeable. Fluids cannot easily flow, but they form good boundaries for trapping gas or oil. These rock boundaries are sometimes called a roof or trap rock. If a layer of sedimentary rocks is tilted upwards with a shale on top of a sandstone, the natural gas will rise upward since it is less dense than water, the gas is trapped by the layer of shale.



Extracting Earth's Resources: Oil

Solitary oil rig pumping beneath the ground *(source: Wikipedia commons)*

- Once oil or gas is found beneath earth's surface by geologists, it must be extracted. Usually this is done by drilling through the rock to where the resource is trapped. When the well is completed, oil or gas can flow into the well and the resources are pumped up to the surface.

- Oil companies drill for oil, and they employ geologists who usually identify the favorable areas that may have oil or gas. These geologists include stratigraphers, sedimentologists, and geophysicists. Many times, however, dry holes are drilled and geologists must move on to other locations.

- In 2005, the United States produced an estimated 9 million barrels of crude oil per day and imported 13.21 million barrels per day from other countries. This oil gets refined into gasoline, kerosene, heating oil and other products. To keep up with our consumption, oil companies must constantly look for new sources of petroleum, as well as improve the production of existing wells.

★ **Current Event**

- The U.S.'s dependence on foreign oil, primarily from the Middle East, has been a major concern for over 3 decades. Politicians have presented the Arctic National Wildlife Refuge in Alaska, home to thousands of migratory animals and precious woodlands, as a potential source for American oil. If Congress approves development, it would take 10 years for oil production to commence. If production were to commence, oil production would peak at 780,000 barrels per day in 19 years and decline to 710,000 barrels per day in 22 years. Currently, the United States consumes about 20 million barrels of oil per day! Drilling for oil beneath the pristine tundra of the Arctic National Wildlife Refuge would do little to ease world oil prices and destroy thousands of acres of wilderness.

The Arctic national Wildlife Refuge *(source: U.S. fish and wildlife service)*

Extracting Earth's Resources: Coal

- While oil and gas is pumped from the earth, coal is removed through excavation. Two common methods are underground mining and strip mining, or open-pit mining.

- Underground mining requires tunneling into the ground in a process called drift mining or slope mining. This is a very dangerous process if done incorrectly or if the area is subject to earthquakes. In addition, toxic methane and carbon monoxide gases are associated with coal mining.

- Strip mining: This method is used when the deposits are close to the surface. Layers of rock and soil are dug up and the coal is removed, or stripped, before returning the rock and soil back to the earth. Trees are re-planted in a processes called "land reclamation" and, if possible, a natural habitat is re-introduced.

★ **Current Event**

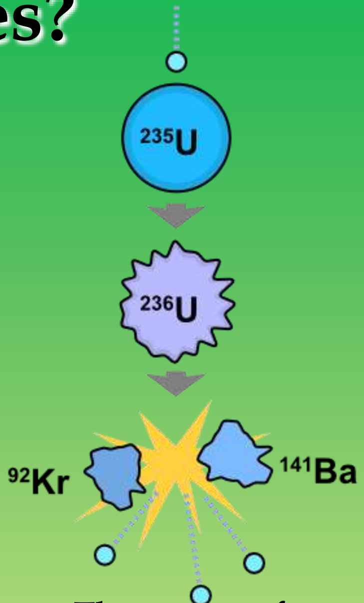
- The Sago Mine disaster occurred in Sago, West Virginia, on January 2, 2006. It was not a tunnel collapse, but an explosion. The cause of the explosion is still unknown; however, some think a lightning bolt struck the mine and ignited a pocket of methane gas. Thirteen men were trapped for over 2 days – only one survived.

The Sago coal mine, Sago, West Virginia

www.livefire.us/index.php?s=barn

Future Resources?

▪ Another type of energy source comes from nuclear energy, which is produced from atomic reactions. Energy is formed when a nucleus from a heavy element is split creating lighter elements and releasing energy. The splitting of heavy elements is called **nuclear fission** and often uses Uranium-235 as the fuel to carry out the process. Unfortunately, uranium is a nonrenewable resource. In addition, nuclear energy produces radioactive waste products that stay radioactive for thousands of years. Currently, research is ongoing in hopes of harnessing **nuclear fission**, the same process that fuels the sun, which can create electricity without any waste.



The process of nuclear fission

Nuclear power plant

http://commons.wikimedia.org/wiki/Image:Nuclear_fission.svg

▪ A potential fuel source currently undergoing research is "**methane hydrate".** These resources are located beneath the seafloor in the form of hydrocarbon ice. It is estimated that more carbon is contained in methane hydrates than in all current fossil fuel deposits combined.

<u>Resource vs. Reserve</u>

▪ A resource is classified as a '**<u>reserve'</u>** when the resource can be extracted for a profit using current technology.

▪ <u>Current reserves of coal will last about 250 years</u> and natural gas can last the U.S. about 60 more years. This is why is it imperative that we not only conserve nonrenewable resources today to ensure their presence for future generations, but find alternate forms of fuel as well.

▪ Everybody can do their part to help conserve, even if it simply means turning off your bedroom light or not using the air-conditioning if it's not necessary.

Using Renewable Resources

Because the world will not be able to depend on oil, gas, and coal forever, we must find other ways to power the kind of life style that we are accustomed to.

Solar panels
(source: Wikepedia commons)

<u>Solar Power</u>

- Solar energy is energy from the sun. We know that global wind and ocean currents are powered by solar energy. More and more, people are investing in solar panels on the roof of their home, whereby solar cells actively collect energy and transform it into electricity.

- Unfortunately, solar cells work less efficiently on cloudy days and not at all during the night. Batteries can be used to store solar energy, but they cannot hold very much and disposing properly of old batteries can be an issue.

A wind farm
(source: Wikepedia commons)

<u>Wind Power</u>

- Wind has been used fro thousands of years as a source of energy on sailing ships and windmills to pump water. Today, windmills can be used to generate electricity, usually located on a wind farm.

- Wind produces no waste; however, not many regions of the world have strong and persistent enough winds to generate electricity.

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Water Power

Dam and hydroelectric powerhouse

- Water wheels have been used for over 100 years to help create energy to ground grain or cut lumber, creating microhydropower.
- Hydroelectric energy is created releasing large amounts of water through a man-made dam, which turn turbines, or generators, to create electricity. **Lake Murray Dam** (photo right) in Columbia is an example of a hydroelectric dam.
- Most hydropower dams in the U.S. were built in the mid-1900's and we are now learning about the detrimental effects that they have on the environment, including sedimentation of the upstream reservoir, migration of fish, and sediment starvation as far downstream as the coast!

Geothermal Energy

- Large reservoirs within the ground contain heated water from internal heat in the earth. This heated water can create steam, thereby producing geothermal energy.
- Only certain regions of the earth have these geothermal hotspots, usually in tectonically active areas or volcanic areas, such as Hawaii and Iceland. Yellowstone National Park would be a very good resource for geothermal energy.

Biomass Energy

- While not heard about very often, biomass energy, which is energy derived from burning organic material like wood, alcohol, or garbage, is a common renewable energy resource. A drawback of burning these items, however, is that particles are released into the atmosphere, potentially increasing air pollution.

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Metallic and nonmetallic resources

- We know that mineral resources include zinc, silver, copper, aluminum and many other metals that we rely on everyday. **Ores** are deposits in which a mineral or minerals exist in large enough amounts to be mined at a profit. Normally, these are **metallic** deposits.

- The key components of classifying a resource as an ore is that the mineral in question must be in demand and enough of it must be present in the deposit to make it worth removing. Economic factors, such as supply and demand, usually determines what is an ore and what is not.

- Extracting the resource, or separating it from the surrounding rock, must be feasible. The waste rock is called gangue. The separation process is called concentrating. The next step, refining, is the step that produces the product from the ore. Refining can be done by smelting, which removes unwanted elements from the metal that is being processed. This relies on chemical processes, but also on the burning of fossil fuels in order to produce the heat for the smelting process.

- Unlike ores, which are mined for their metallic physical properties, **nonmetallic resources** can be just as useful and valuable. The two types of non-metallic mineral resources are 1) industrial minerals and 2) building materials, although some belong to both groups.

Vulcan Iron mine. (USGS)

Smelting process

Nonmetallic mineral resources

Table salt is made from the mineral halite (NaCl)

1. **Industrial minerals** include halite (table salt), silica (glass), and sylvite (fertilizer). All naturally occurring minerals have a variety of physical properties like hardness, texture, and cleavage, and these can be used in a variety of everyday items. The mineral talc is very soft and is used to make baby powder. In contrast, corundum is very hard and scratches most other surfaces, so is a main ingredient in some cleaning abrasives. Small garnets can be attached to paper to make heavy duty sand paper. Kaolinite, which is has a very low Ph, is used in Kaopectate, to soothe stomach discomfort.

A granite building with carved detailing

2. **Building materials** include crushed stone, gravel, and sand, also known as aggregate. Aggregate is a component for making concrete. Limestone is also used in concretes and paving stones. Gypsum is used in dry wall and plaster. Metamorphic (marble), igneous (granite), and sedimentary rock (sandstone) are used for building material. Marble, which is metamorphosed limestone, is used in statues and headstones.

★ Although metallic and nonmetallic resources come from the ground, these are nonrenewable resources because they take millions to billions of years to form.

South Carolina Science Academic Standards

Grade 3:

Standard 3-3: The student will demonstrate an understanding of Earth's composition and the changes that occur to the features of the Earth's surface.

Indicators: Exemplify Earth materials that are used as fuel, as a resource for building materials, and as a medium for growing plants.

Grade 7:

Standard 7-4: the student will demonstrate an understanding of how organisms interact with and respond to the biotic and abiotic components of their environments (Earth Science, Life Science).

Indicator 7-4.6: Classify resources as renewable or nonrenewable and explain the implications of their depletion and the importance of conservation.

Grade 5:

Standard 5.3: The student will demonstrate an understanding of features, processes and changes in Earth's land and oceans (Earth Science).

Indicator: 5-3.6 Explain how human activity (including conservation efforts and pollution) has affected the land and oceans of the Earth.

Grade 8:

Standard 8-3: The student will demonstrate an understanding of materials that determine the structure of Earth and the processes that have altered this structure (Earth Science).

Indicator 8-3.5: Summarize the importance of minerals, ores and fossil fuels as Earth resources on the basis of their physical and chemical properties.

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