# WHAT'S THE EARTH WORTH?

## Introduction

**Forged over 4.6 billion years, the earth is stacked with valuable riches from timber to cattle to gold. Together, humans have used these resources to build our greatest civilizations. So what if we could scan the planet as if we were in a checkout line at a grocery store and count up every tree and every nugget of gold in one gigantic inventory?**

HISTORY®'s *What's the Earth Worth?* puts a price tag on all commodities in their raw state, before humans have added value through design or manufacture. In the process, we'll get a macro view of history by examining how prices and demand for certain resources have changed over time as new technologies make new materials valuable while rendering others useless.

## Curriculum Links

*What's the Earth Worth?* is useful for history, social studies, economics and math classes. There are many cross-curricular links, including STEM-related activities. The program is appropriate for middle and high school students. Educators can view the full episode for extended activities and research projects.

## Vocabulary

Using a dictionary or an encyclopedia, students may want to define or explain the significance of the following terms from this program. Students can also keep their own list of terms to define as they watch.

- aggregate
- aquifer
- base metals
- commodities
- conductor
- corrosion
- deforestation
- fossil fuels
- mercantile exchange
- minerals
- oil shale
- precious metals
- rare earth materials
- tree feller


**ATTENTION TEACHERS:** *What's the Earth Worth?* is divided into nine components of the earth and how much they are worth in dollars. The following guide is also divided into nine sections, but you do not have to watch the full episode to work on the guide.

HISTORY

# PRECIOUS METALS

The New York Mercantile Exchange trades everything from natural gas, butter, copper, and even pigs. But some of the most valuable items up for sale are groups of commodities we most associate with wealth. Precious metals are precious because they are rare and difficult to extract from the earth. Of the eight precious metals in the earth, the most valuable are silver, gold and platinum. Let's take a closer look at the price of gold.

There are a number of reasons why the price of gold changes on a daily basis and fluctuates over time. One of those reasons is supply and demand.

1. **What is the relationship between supply and demand?**

2. **Explain one reason (hypothetical is okay) why there may be an increase in demand for gold.**

3. **How does supply and demand affect the price of a precious metal?**

4. **What is a troy ounce? Research the historical reasons why gold is measured in troy ounces and write your findings here.**

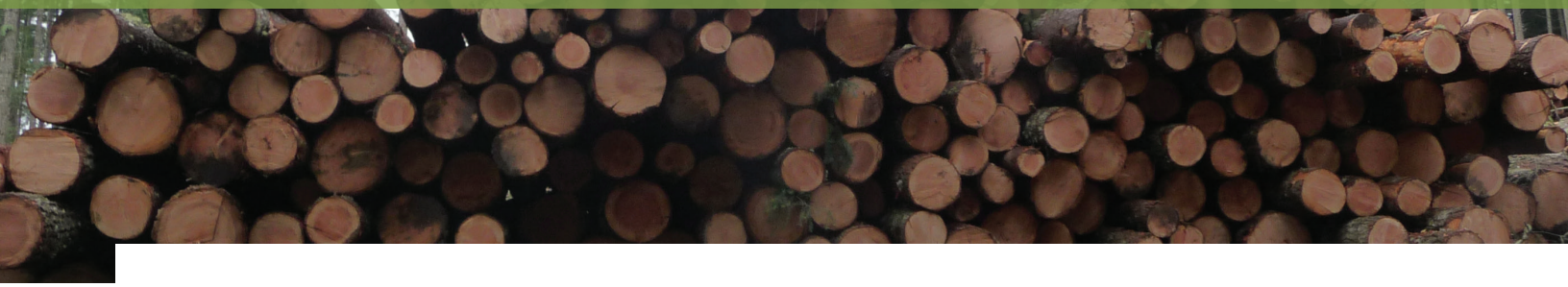
5. **Research the current price of the following precious metals online:**
   - Gold
   - Silver
   - Platinum

6. **Which of the above precious metals would you look to purchase right now and why? Which would you look to sell and why?**

**Using the data below, create a line graph that charts the price of gold over the last 115 years.**

| YEAR | PRICE OF GOLD PER OUNCE |
|---|---|
| 1900 | $18.96 |
| 1920 | $20.68 |
| 1930 | $20.65 |
| 1940 | $33.85 |
| 1950 | $34.72 |
| 1960 | $35.27 |
| 1970 | $36.02 |
| 1980 | $615.00 |
| 1990 | $383.51 |
| 2000 | $279.11 |
| 2010 | $1,224.53 |
| 2015 | $1,571.52 |

# TIMBER



There's another commodity that's far more valuable than precious metals although it is not rare at all: wood. It's found everywhere you look. It's been critical to human evolution, allowing us to cook our food and thus provide more energy for our brains to grow. Wood has given us shelter and built the ships that explored the world. Timber is one of the earth's most versatile products.

- **Define natural resource**
- **Define man-made resource**
- **What are some man-made resources made of wood?**

**Take a look around you. What objects or items are closest to their natural state? Do you see a wooden pencil? What about a wooden desk? Is there metal on a chair? Consider all the items within your reach and think about where each one came from and the journey it took to get to your classroom. Was the product modified from its original state? Consider the energy that went into manufacturing it. Consider the transportation required to get the item to a store and then delivered to your classroom. Pick a few items and detail their life cycles below.**

**Item:**

**Natural state:**

**Explain how you think it was manufactured:**

**Explain how it was likely transported to your classroom:**

**Consider all of the energy it took to be manufactured and produced:**

**Can your item be recycled?**

**Can your item be reused?**

**COMPLETE THE EXERCISE ABOVE FOR AT LEAST THREE ITEMS IN YOUR CLASSROOM.**

# ROCK

The planet Earth is a giant warehouse of valuable resources, from precious metals buried deep underground to billions of trees above. One commodity has provided the foundation for civilizations, bringing us out of mud huts and grass houses and eventually providing the material for us to build our greatest monuments and cities. This natural resource is rock.

**What are the uses for the following rocks? Match the rock with its use.**




cement

Mount Rushmore

Pyramids of Giza

chalkboard

roofing

The Pentagon

interior flooring

countertops

## Hoover Dam

In the early 20th century, the U.S. Bureau of Reclamation devised plans for a massive dam on the Arizona-Nevada border to provide water and hydroelectric power from the Colorado River to the developing Southwest. Construction of this cement structure within a strict time frame proved an immense challenge, as the crew bored into carbon monoxide-choked tunnels and dangled from a height of 800 feet to clear canyon walls. The largest dam in the world upon its completion in 1935, this National Historic Landmark stores enough water in Lake Mead to irrigate 2 million acres and serves as a popular tourist destination. For a short video about the Hoover Dam, visit: http://www.history.com/topics/hoover-dam/videos/deconstructing-history-hoover-dam.

# FOOD

One important group of commodities is different from all others and is critical to our daily survival: food. For millennia, humanity has survived on three major sources of food: meat, crops and seafood. Let's take a look at crops.

In the early ages, when threatened by extinction, humans used their minds to innovate. Farming was invented, animals were domesticated, small towns and cities emerged and networks of trade blossomed.

## Research & Discussion Questions

**1**

Research the history of agriculture. How was farming first conceived? What is the significance of agriculture on the development of societies?

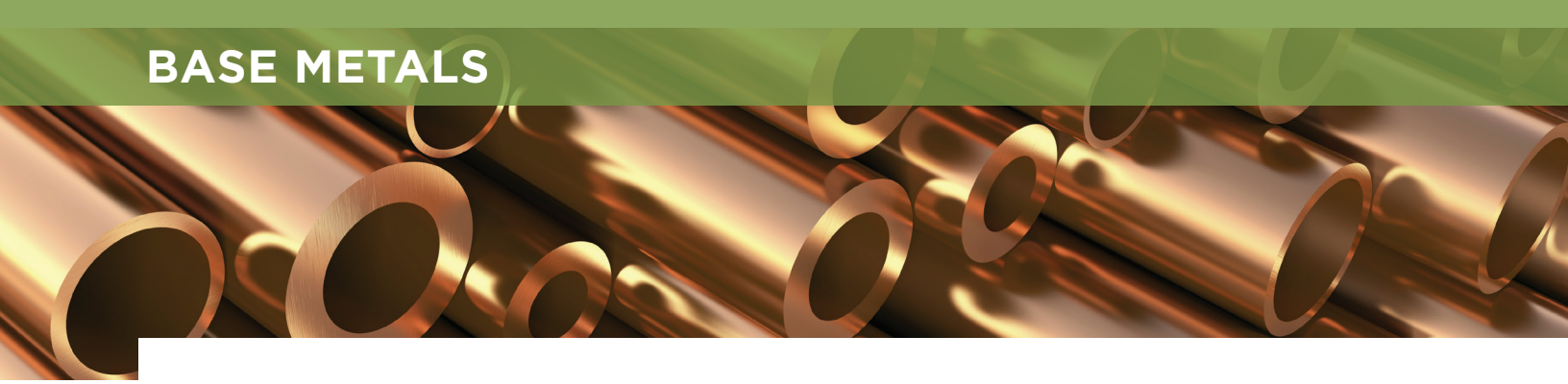
**2**

In America, there are more than 330,000 farms that produce corn – that's more corn production annually than any other country by a large margin. But most of that corn never makes it to our dinner tables. Research and list ten uses of corn. Did any of these uses surprise you? Why? Do you think you could cut corn and corn products out of your daily diet? Would it be difficult or easy and why?

**3**

Research the difference between sweet corn, field corn and popcorn. Which kind of corn represents 99 percent of the corn grown in the U.S.?

# BASE METALS



We've seen that gold, silver and platinum are pricey and hard to find; they are so rare that we call them precious. But there's a group of tougher, more versatile metals buried in the earth's crust that are called base metals. These are materials we have forged, hammered, and blasted for nearly 5,000 years to make tools, weapons, coins and even bridges. The most valuable of these metals are zinc, copper and iron.

## Research & Discussion Questions

### 1

Take a look at the periodic table below and circle the 27 base metals. Pick three of the base metals, research and list the uses of each one, and find out why its abbreviation was chosen. Look online to check your work.

### 2

Define the word alloy. What two metals make up the alloy steel? Name three uses for steel. What is the significance of steel in the Industrial Revolution?

## PERIODIC TABLE OF THE ELEMENTS

# FOSSIL FUELS

Our society is largely dependent on fossil fuels. Fossil fuels are the remains of dead plants and animals buried beneath the earth's crust over hundreds of millions of years. Immense pressure and high temperatures have compressed the ancient organic matter into vast deposits of our most important energy resources.

## Research Questions

**1**

**Three fossil fuels are coal, oil and natural gas. What are three uses for coal? Oil? Natural gas? Is natural gas the same as gasoline? Why or why not?**

**2**

**What are some ways our society can limit the use of fossil fuels in the creation of electricity?**

**3**

**What are some ways you personally can save energy? List ten ways you or your school can save energy.**

## Science Experiment: Oil Spill Cleanup

(The following activity is adapted from a worksheet designed and developed by the National Wildlife Federation.)

**Fossil fuels are useful in our everyday lives because they aid in the creation of electricity to heat our homes, run our vehicles and power industry and manufacturing. Crude oil is a fossil fuel that is transported all over the world, often by boats through a vast array of waterways. When an oil spill occurs, do you know how environmentalists would clean it up? Let's find out:**

### Purpose

To study the effects of an oil spill on nature and explore ways to clean it up.

### Prediction

Before you start, predict what would happen when oil spills into a body of water. Is it contained in one place? Does it spread? What happens to plant life and animals in and near the water?

### Materials Needed

- aluminum pie plate
- cotton
- detergent
- fake fur from a craft store
- feathers from a craft store
- food coloring
- salt
- straw
- vegetable oil
- water

### Activity

1. Pour water into the aluminum plate and fully cover the bottom. Then pour some vegetable oil onto the water.
2. Observe and record what happens to the oil and water.
3. To clean up the oil, try using materials such as cotton, straw, fake fur, feathers and detergent or a combination of materials.

(Activity continues on the next page.)

## Record what happens to the oil with each material:

| Material | What happens to the oil with each material? Does the oil cling to the material? | Did it work to clean up the spill? Explain why or why not. | How much time did it take to clean up the oil? |
|---|---|---|---|
| | | | |
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**Did you find that the oil could be contained to a small space with any one of the materials? Explain:**

## Questions

**1**

**What techniques work best?**

**2**

**What effect did the detergent have on the oil?**

**3**

**What might the oil on the feather tell us about the effects of oil spills on birds?**

**4**

**Fire is another method of cleaning an oil spill. Hypothesize what would happen to the oil when it burns. What kinds of problems might this cause?**

For more information about this activity and additional information, visit **http://www.nfw.org**

# PRECIOUS STONES

Next on the list is a group of commodities priced for their beauty and their brawn. They are the hardest naturally occurring materials on earth: precious stones. There are more than 130 different precious stones – minerals forged below the earth's surface through a variety of geological processes. One of those precious stones is the diamond.

1

**Research and define the difference between gem-grade diamonds and industrial diamonds. How are diamonds used in industry?**

2

**Define the word carat. How does a carat relate to a diamond? What is the going rate (in U.S. $) for an industrial diamond? What about a gem-grade diamond?**

3

**Research and define kimberlite rock. What area is the rock named after and why? How does kimberlite rock get to the surface of the earth?**

# RARE EARTH ELEMENTS

Without rare earth elements, our world would look very different. We wouldn't have cell phones and laptops. On the road, any car with the latest technology would be gone. At the airport, our high-tech planes could not fly. Rare earth elements are found in very small quantities all over the world, both on land and in the seabed. There are 17 different rare earth elements.

## Research & Discussion Questions

1

**Take a look a the periodic table on page 6 of this guide. Take a look at elements 57-71 and 89-103. Why do you think these elements are on the bottom instead of where they belong on the table? Now, circle the rare earth elements.**

2

**Pick a rare earth element from the group. Research and answer the following questions about your chosen element.**

Name of the element:
Where does the name of the element come from?
Describe the uses of the element:
What is the going price of the element?
Where is the element found in the world?
Which country mines this element the most?
What makes this element so desirable?

# WATER

We cannot, under any circumstances, survive without water. Every cell in your body is pumped full of water – **you need water to even think about water!** All great civilizations grew around a dependable water supply. For Ancient Rome, it was the Tiber River; for the Egyptian pharaohs, it was the Nile; for the Chinese dynasties, the Yangtze.

Most of the water on earth is undrinkable. Only 3 percent of the earth's water is fresh (drinkable) and 97 percent of the water on earth is salt water. One way to access clean water from salt water is to conduct a process called desalination. Below is an activity that does just that.

## Activity: Building a Solar Still

**Materials**

- pitcher
- water
- salt
- spoon
- measuring cup
- 1 tablespoon
- large bowl
- short glass or cup
- tape
- plastic wrap
- small rock

**Background**

Salt water, from the ocean for example, cannot be used for drinking water. But there is a way to remove the salt with a few simple materials. Today we will build a solar still which will remove salt from water and leave us with fresh drinking water.

**Procedure**

1. Fill a pitcher with 4 cups of water. Add 2 tablespoons of salt and stir until the salt dissolves.
2. Pour the salt water mixture into the large bowl, a few inches in depth.
3. Place the short glass or cup in the middle of the bowl right side up, making sure that the salt water does not flow into the glass.
4. Cover the bowl with plastic wrap. Secure the plastic wrap with tape around the outside of the bowl.
5. Place a small rock in the center of the plastic wrap so that it is directly above the small glass.
6. Place the entire bowl outside on a sunny day. Leave it outside for at least a few hours or even all day.
7. After at least four hours of sun on the bowl, look to see if there is any water collected in the small glass.

**Complete the following questions:**

Describe what you see in the small glass after the experiment.
Describe what you see in the larger bowl after the experiment.
How will you test the salt quantity of the water in the smaller glass?
What happened to make water appear in the smaller glass?
What was the purpose of the rock?
What was the purpose of the sun?
Do you think this process would work in a large-scale application? Why or why not?

## Websites/Resources

**History.com**

**The Alliance to Save Energy**
**http://www.ase.org/initiatives/education**

**U.S. Energy Information Administration – Energy Kids**
**http://www.eia.gov/kids/**

**Geological Society of America**
**http://www.geosociety.org/educate/**

**Students for the Environment – US EPA**
**http://www.epa.gov/students/**