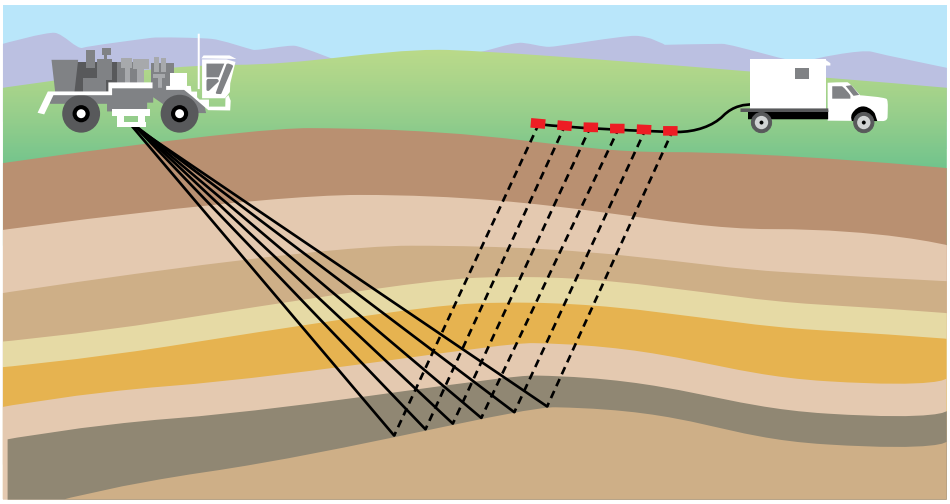
5 Finding Resource Deposits

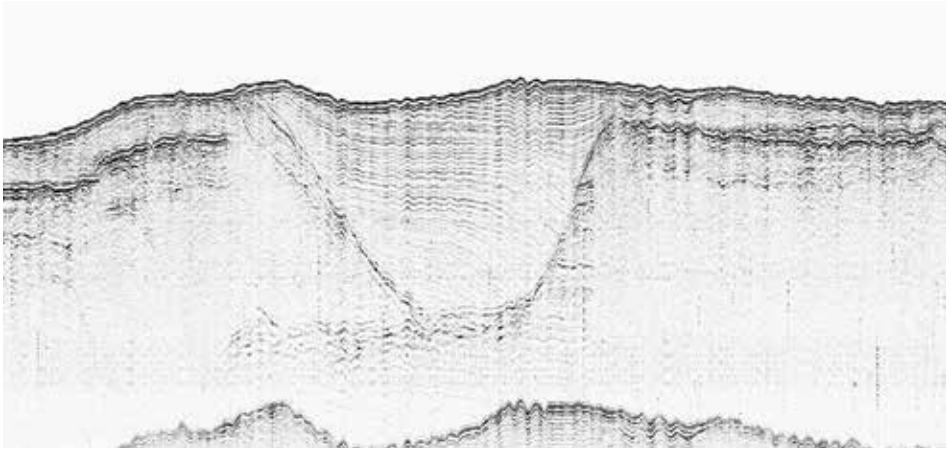
MODELING

Natural resources are not distributed evenly around the planet, and people go to great lengths to find deposits buried deep underground. Certain resources tend to form in certain types of rock, such as sandstone, and in certain settings, such as ancient oceans or streambeds. Recognizing these rocks and environments is often the key to finding resources.

Modern technology has provided new tools for finding resources. **Remote sensing** refers to any technology that provides information about an object that we cannot directly see. A remote sensing method called seismic reflection helps people "see" resources and geological structures that are deeply buried.



The truck on the left releases seismic waves into the ground, and the array of red sensors on the right records the waves after they have reflected off subsurface features.



This diagram shows a profile of a buried river channel produced from remote sensing data.

Seismic reflection works by sending shock waves down into the earth. The timing and shape of the waves reflected back to the surface is recorded. The waves reflect off materials differently based on their properties. Geologists analyze and interpret the reflected waves. They then use this information to map the shapes of structures and the boundaries between different resource types.

In this activity, you will model the collection and interpretation of remote sensing data. A **model** is any representation of a system (or its parts) used to help someone understand and communicate how the system works.

GUIDING QUESTION

How are underground deposits of natural resources located?

MATERIALS

For each group of four students

- 1 Remote Sensing Box
- 2 measuring probes
- 5 colored pencils or crayons: red, yellow, orange, green, and blue

For each student

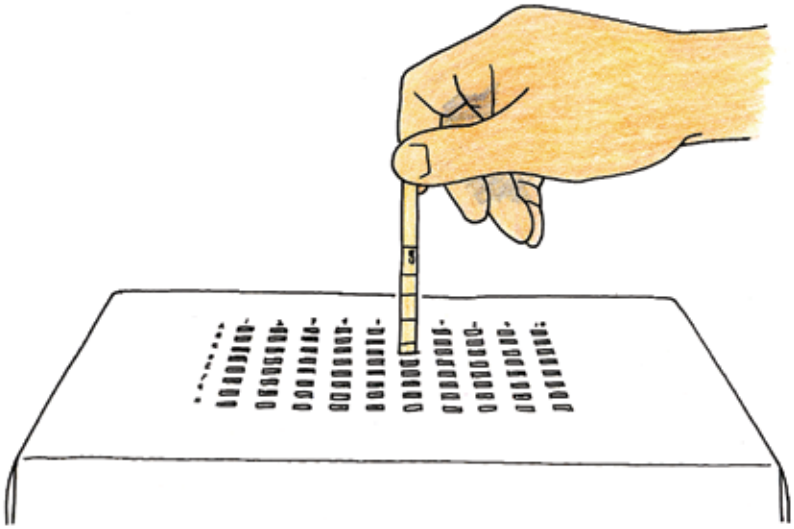
- 1 Student Sheet 5.1, "Mapping Subsurface Structures"

PROCEDURE

Part A: Collecting the Data

1. Compare the top of your Remote Sensing Box with the Part A data table on Student Sheet 5.1, "Mapping Subsurface Structures." Each empty box on the table represents one of the holes in the top of the model. There are 80 holes, and each hole represents the location of a "seismic data point."
2. Each group member is responsible for collecting at least 20 data points. Decide who will collect data from which holes.

3. In this model, the measuring probe represents a reflected seismic wave. At each of your assigned data points, you will collect your data by doing the following:
   - Carefully insert the probe into the hole as close to vertically as possible.
   - Keeping the probe vertical, gently push it down until you feel it hit something.
   - Measure the depth as soon as your probe makes contact. Do not push the probe farther into the box.



4. Round your measurement to the nearest 0.1 cm, and record it in the appropriate box of the table on Student Sheet 5.1.
5. Once your group has collected all 80 data points, share your data so that each group member's table is completed.

Part B: Mapping Structures

6. Complete Part B of Student Sheet 5.1. Use the key to create a false-color map by coloring each square with the appropriate color for its measured probe depth.

7. The following table provides data about the location of some natural resources.

   a. Discuss the information in this table with your group.

Locating Natural Resources

RESOURCE	OFTEN FOUND IN ROCKS . . .
Fossil fuels	formed in ancient bodies of water (e.g., wetlands or seas) and/or as liquids and gases trapped as a result of geological processes.
Dense, resistant materials (e.g., gold, diamonds)	formed by moving water (e.g., river channels and shorelines).
Metals (e.g., silver, copper, lead, zinc)	in areas with evidence of past volcanic activity and/or subsurface magma (hot molten rock).

   b. Using the information in the table, work with your group to figure out what underground or surface features might indicate the presence of each of the listed resources. For example, an ancient body of water may have created a basin that still exists today. Describe these features in your science notebook.

8. Compare the information on your false-color map to the information in Step 7. Describe the subsurface structures revealed by your remote sensing data. Record your response in your science notebook.

9. Discuss the following questions with your group, and record your responses in your science notebook:

   a. Based on your remote sensing data, which areas do you think are most likely to contain fossil fuel deposits? Explain your reasoning.

      Hint: Use the row and hole grid to specify the location. For example, fossil fuel deposits are likely to be found in the area between Rows E and H and Columns 3 and 4.

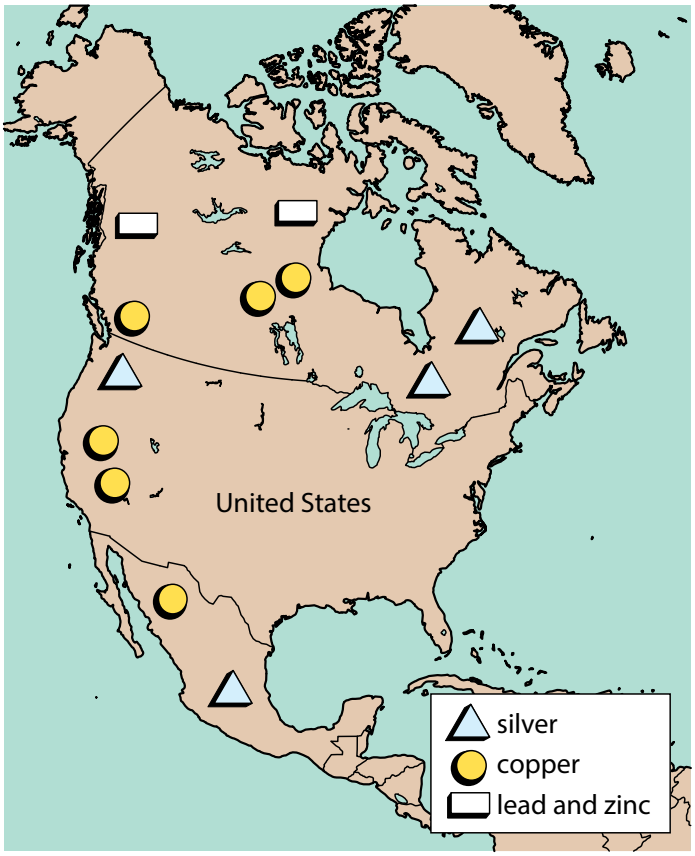
   b. Based on your remote sensing data, which areas do you think are most likely to contain gold deposits? Explain your reasoning.

ANALYSIS

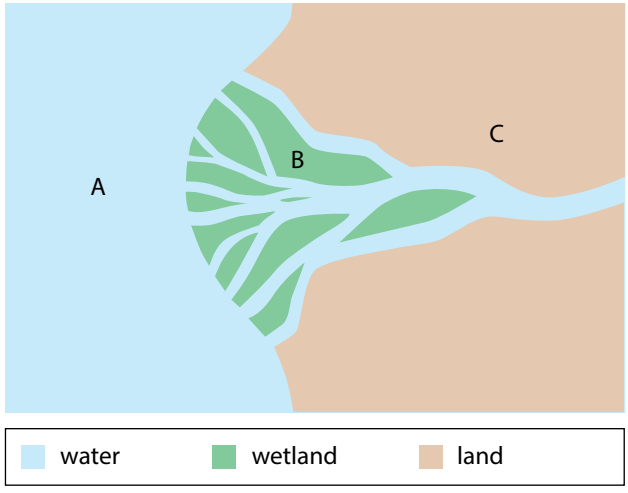
1. Was the box and the probe a good model for seismic reflection? Describe the strengths and weaknesses of this model.

2. In a false-color map, does it matter which color is used for each measurement range? Why or why not?

3. Look at the following map. Do you think you are more likely to find evidence of volcanic activity in the western or eastern parts of the United States? Explain your reasoning.



4. Imagine that you are a geologist for an energy company trying to locate fossil fuel deposits. The following map represents a reconstruction of a past environment. Which area(s) do you think are most likely to contain fossil fuels? Support your answer with evidence from this activity.



5. **Revisit the issue:** Natural resources are distributed unequally around the world.
   a. Why do you think certain natural resources form in one place and not another?
   b. How do you think this affects the value of natural resources?