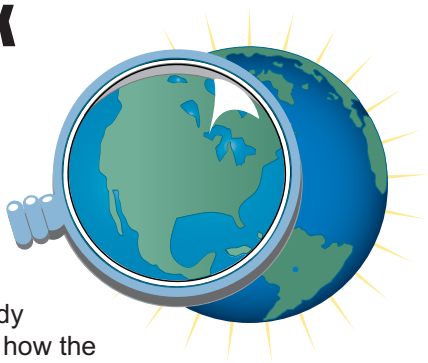
How do paths look from different perspectives?



Investigation Overview

This investigation uses literature to study paths and to help students understand how the world looks from different elevations. Students also identify natural and human-made paths in satellite images. A local or state map is the basis for an activity in which a flashlight beam from different distances demonstrates the possible view at different altitudes. The investigation concludes with an examination of satellite images of three cities. Students identify natural and human-made pathways in the images.

Time required: One to two 45-minute sessions

Materials/Resources

Flashlights, penlight suggested
Large map of students' community or state, laminated or covered with clear acetate
Erasable magic marker for the laminated map
NASA images (make overhead transparencies):
- Figure 1: New Orleans, Louisiana
- Figure 2: San Francisco, California
- Figure 3: New York City, New York

Books
- *The Ultimate Field Trip* <http://eol.jsc.nasa.gov/uft/uft.html>
- *Little Red Riding Hood, Over the River,* or *Hansel and Gretel*
- *Alice in Wonderland* or *Big Bad Bruce*
- *Jack in the Beanstalk* or *Gulliver's Travels*
- *Me on the Map, Ily,* or *Around the World in 80 Days*

Content Preview

Satellite images, because of their breadth and scope, can help people make decisions about how to use, maintain, and build paths. They can also help people to see natural paths such as fault lines. Detailed descriptions of paths in New Orleans, San Francisco, and New York City point out the number of paths in urban areas.

Classroom Procedures

Beginning the Investigation

1. Review with students why pathways are important to them and to other family members. Tell students that many authors have written about paths. Ask them to think about books in which paths are very important. Some leads may be, "Do you know who . . . "
   - followed "The Yellow Brick Road?" (*Dorothy and friends in* The Land of Oz.*)*

Geography Standards

Standard 2: The World in Spatial Terms

How to use mental maps to organize information about people, places, and environments in a spatial context

- Identify major physical and human features at a variety of scales using maps, globes, and other sources of graphic information.

Standard 14: Environment and Society

How human actions modify the physical environment

- Identify ways in which humans alter the physical environment.

Geography Skill

Skill Set 4: Analyzing Geographic Information

- Use texts, photographs, and documents to observe and interpret geographic trends and relationships.

- went to Grandmother's house with a basket of baked goods? (Little Red Riding Hood.)
- went "Over the River and Through the Woods?" (*Grandchildren in the song with the same name.*)
- spread crumbs on a pathway leading home? (Hansel & Gretel.*)*
- followed the North Star to freedom? (*Slaves in* Follow the Drinking Gourd.*)*

Developing the Investigation

2. Read from one of the books listed below. (For the youngest children, *Little Red Riding Hood*, *Over the River,* and *Hansel and Gretel* are appropriate. Visit web site: <http://spaceplace.jpl.nasa.gov/eo1_1.htm> for activities for *Little Red Riding Hood* on the path.)

3. Talk about how the paths would look different:
   - from the view of an ant. (Read *Big Bad Bruce* [grades K-3] or portions of *Alice in Wonderland.)*
   - from the view of a giant. (Read *Jack in the Beanstalk* or portions of *Gulliver's Travels*.)
   - from an air balloon or plane. (Read *Me on the Map, Ily,* or portions of *Around the World in 80 Days*.)
   - from a space craft or satellite. (Read NASA's publication *The Ultimate Field Trip.* For younger students, this book can be told rather than read.*)*

4. Do the following activity to help students understand how paths look from various heights and how much of the area can be seen from these altitudes.

   A. Put a large map of the students' community or state on the floor or wall. If possible, laminate the map or cover the map with a clear sheet of acetate if it is to be used again.

   B. Trace paths (roads, railroads, bridges) leading into the city/town/community. Talk about where the roads go, their purposes, and whether the paths are straight or curved and why. (*Because of obstacles, both human and natural.*)

   C. Direct a flashlight (a small penlight is best) very close to the map. Use an erasable magic marker to draw a circle around the area that is directly lighted. Talk about how much of the paths can be seen at this level. Compare this with a helium balloon view.

   D. Move the flashlight farther from the map in the same spot. Draw a circle around the area directly lighted. Have students talk about the area lighted and the intensity of the light. (*The area lighted will be larger; however, the intensity of the light will decrease as the flashlight is farther from the map.*) Continue at levels that simulate a view from an airplane, a Space Shuttle, and a satellite. Observe the paths and talk about how much more is seen as the flashlight is pulled father away.

   E. Talk about the ways satellites can be used to observe large parts of Earth's surface from space. (*Monitoring land use change, weather, vegetation patterns, etc.*)

Concluding the Investigation

5. Project transparencies of **Figures 1**, **2**, and **3**. (See **Background** and share the information about each satellite image, as appropriate.)

6. Have the students take turns identifying the paths made by people: roads, railroads, bridges, etc. Why were the paths made and how did they change the environment?

7. Ask students to find paths that were not built by people. (*Rivers are the most obvious in* ***Figures 1 and 3****. In* ***Figure 2****, fault lines can easily be detected. See* ***Background****.*) Tell students that these are "natural" pathways. Have students trace them on the transparency.

8. Have students talk about the benefits of having these satellite images. (*We can see how things are connected, where to put new human-made paths, and the changes in natural and human paths. The images help people make decisions about how to use, maintain, and build paths.*)

Background: Images

Figure 1: Area around New Orleans <http://southport.jpl.nasa.gov/pio/sr12sirc/sr12-neworleans.gif> This image shows the area surrounding New Orleans, Louisiana. It is an excellent site for identifying bridges and roads. The dark area in the center is Lake Pontchartrain. The thin line running across the lake is a causeway. The Mississippi River appears as a dark, wavy line in the lower left. The white dots on the Mississippi are ships. Note the New Orleans Airport. It is the bright spot near the center, jutting out into Lake Pontchartrain.

Figure 2: San Francisco <http://southport.jpl.nasa.gov/pio/srl2/sirc/srl2-sfc.gif> This image shows San Francisco, California. Downtown San Francisco is at the center, and the city of Oakland is at the right across San Francisco Bay. Some city areas, such as South of Market,

called the SOMA district, appear bright red due to the alignment of streets and buildings to the incoming radar beam. Various bridges in the area are visible, including the Golden Gate Bridge (left center) at the opening of San Francisco Bay, the Bay Bridge (right center) connecting San Francisco and Oakland, and the San Mateo Bridge (bottom center). All the dark areas on the image are relatively smooth water: the Pacific Ocean to the left, San Francisco Bay in the center, and various reservoirs. Two major faults bounding the San Francisco-Oakland urban areas are visible on this image. The San Andreas fault, on the San Francisco peninsula, is seen in the lower left of the image. The fault trace is the straight feature filled with linear lakes which appear dark. The Hayward fault is the straight feature on the right side of the image between the urban areas and the hillier terrain to the east.

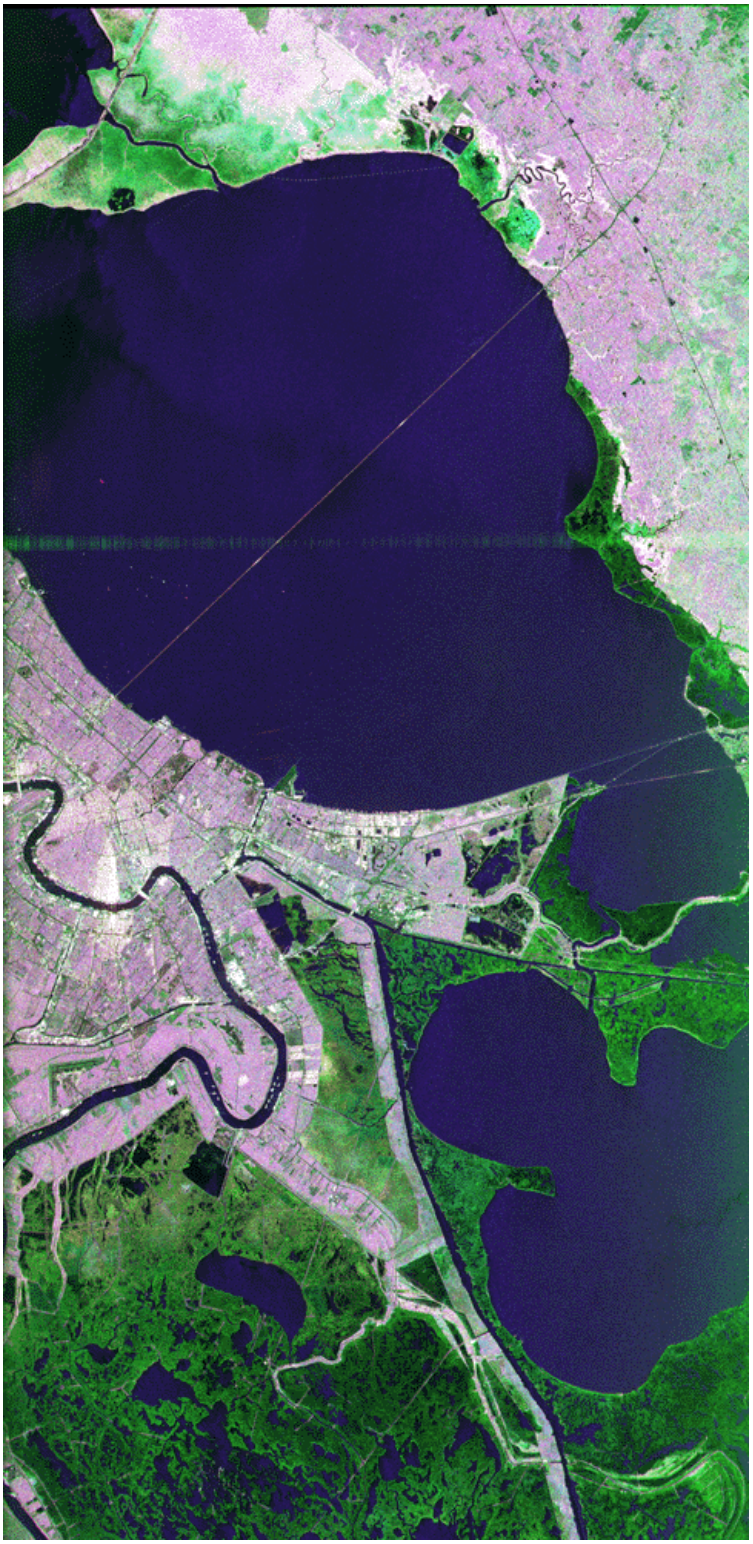
Figure 3: New York Metropolitan Area <http://southport.jpl.nasa.gov/pio/srl2/sirc/srl2-nyc.gif> This is a radar image of the New York metropolitan area. North is toward the upper right. In general, light blue areas correspond to dense urban development, green areas to moderately vegetated zones, and black areas to bodies of water. The Hudson River is the black strip that runs from the left edge to the upper right corner of the image. It separates the states of New Jersey and New York. The Atlantic Ocean is at the bottom of the image where two barrier islands along the southern shore of Long Island are also visible. John F. Kennedy International Airport is visible on the mainland, across from these islands. Long Island Sound, separating Long Island from Connecticut, is the dark area right of the center of the image. Many bridges are visible in the image. From south to north along the Hudson River are the Verrazano Narrows, George Washington, and Tappan Zee bridges. Manhattan is south of the George Washington Bridge, to the east of the river. Central Park is a large rectangle in Manhattan. The radar illumination is from the left of the image; this causes some urban zones to appear red because the streets are at a perpendicular angle to the radar pulse.

Related Resources

http://spaceplacejpl.nasa.gov/facts.htm NASA relief maps
http://www.erc.nasa.gov/ Writing an essay describing a flight and view from a plane
Looking Down by Steve Jenkins (Houghton Mifflin Co., New York, 1995)
As the Crow Flies, a First Book of Maps by Gail Hartman (Aladdin Books, Maximillan Publishing, 1991)
Oh, the Places You Go by Dr. Seuss
http://www.usgs.gov/ Educator lessons on map adventures
Figure 1: http://southport.jpl.nasa.gov/pio/srl2/sirc/srl2-neworleans.gif
Figure 2: http://southport.jpl.nasa.gov/pio/srl2/sirc/srl2-sfc.gif
Figure 3: http://southport.jpl.nasa.gov/pio/srl2/sirc/srl2-nyc.gif

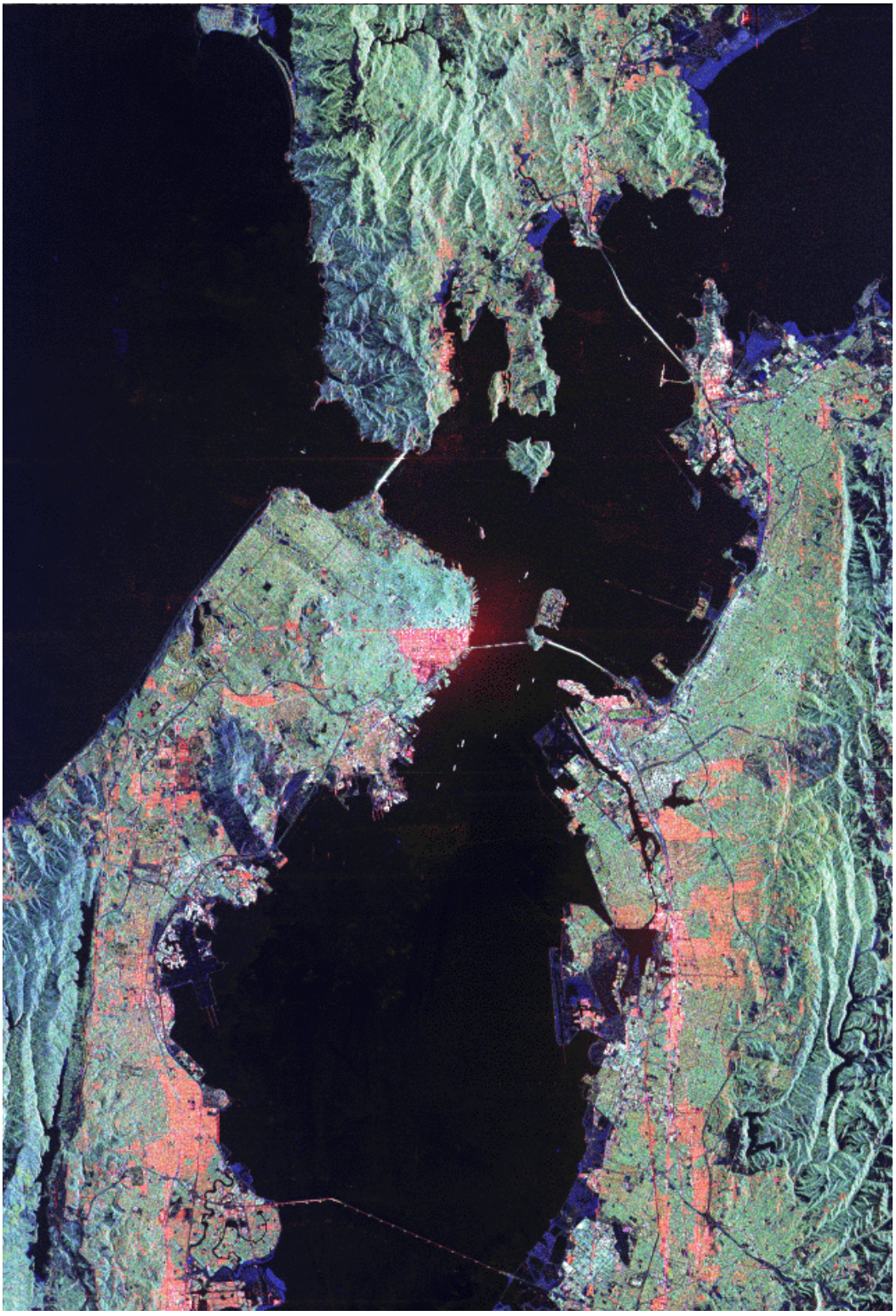
Module 4, Investigation 2: Figure 1

New Orleans, Louisiana



Module 4, Investigation 2: Figure 2

San Francisco, California



Module 4, Investigation 2: Figure 3

New York City, New York