



How can we compare maps with images from space?



Investigation Overview

Students examine maps at different scales and make observations about the amount of detail they can see. They compare satellite images with maps and use satellite images to measure and map changing land use.

Time required: Two 45-minute sessions

Materials/Resources

Fire drill map of the school

Maps of the community, county or parish, state, the United States, North America, and the world. The last four maps can be printed from <http://www.nationalgeographic.com/xpeditions/main.html?main=atlas> if wall maps are unavailable.

Aerial photograph of the school community (<http://www.terraserver.com>)

Log 1: Why do we need satellites? (one for each student)

Log 2: It's a map! or It's an image!—Boxes (one for each student)

Log 3: It's a map! or It's an image!—Poster (one for each student)

Log 4: What do you see in this image? (transparency and one copy for each student)

Log 5: How has this place changed? How do you know? (transparency and one copy for each student)

Ruler

Fine black markers for students

Black transparency marker

Content Preview

Maps, aerial photographs, and satellite images show different information about Earth. Maps are graphic representations of selected Earth features. Aerial photos are photographs of Earth's surface taken from an airplane at different distances from Earth. Satellite images are digitally produced representations of Earth taken from orbiting sensing devices on satellites. Both aerial photographs and satellite images can capture all recordable detail. Maps can be drawn to portray just one or a few themes. Each representation is useful for different purposes. Satellite images are analyzed to identify meaningful categories; then the image can serve as the basis for a thematic map when a theme is selected, for example, land use change. Some satellite images are true color; some are false color. Various kinds of surface materials can be distinguished from each other by differences in the energy they reflect. At certain energy wavelengths sand reflects more energy than green vegetation, while at other wavelengths it absorbs more (reflects less) energy. In the near infrared wavelength, vegetation appears bright red.

Geography Standards

Standard 1: The World in Spatial Terms

How to use maps and other geographic representations, tools, and technologies to acquire, process, and report information from a spatial perspective

- Identify and describe the characteristics and purposes of geographic representations, tools, and technologies.

Geography Skills

Skill Set 4: Analyzing Geographic Information

- Use maps to observe and interpret geographic relationships.

Classroom Procedures

Beginning the Investigation

1. **Maps of smaller and larger areas.** Show students the fire drill map of the school. Ask students to describe what they know about the school from looking at this map. (*The map shows the locations of selected features such as classrooms, cafeteria, offices, hallways, etc.*) Explain that this map is a drawing that shows where some things and places are located. Ask why schools have maps like this.

Next, show students a variety of maps at different scales (the community, county/parish, state, United States, North America, and the world). Have students discuss the features shown on the maps. What is the purpose of each map? What information does each present? What is a map?

Developing the Investigation

2. **Aerial photograph.** If available, show students an aerial photograph of their school community. Explain that it was taken from an airplane. Have them locate the school in the photograph. Ask students to identify other places that they recognize. Then, look at the map of the same community. Ask if the photo and the map look the same or different. Ask students to indicate how the map is different. What objects can they see in the photograph that are not on the map? (*Buildings, farms, trees, parks, maybe some streets and roads.*) Summarize that maps show selected features and often have a theme or purpose; aerial photos show more detail and do not have a theme. They are pictures.
3. Have students study a map of the United States and ask them if they can see any of the streets, roads, lakes, rivers, etc. on this map that they saw on the community map. Ask why they can't see these features on the U.S. map. Compare the size of the area covered on the community map to the area on the U.S. map. Unless it is a large city, the community may not even be named on the U.S. map. Why not?
4. Compare the U.S. map to the North America and world maps. Ask students to identify features that can be seen on each map. Ask which features are visible on the U.S. map but not on the North America map. Which are visible on the North America map but not on the world map? Why? (*The larger the area shown the less detail can be mapped.*)
5. **Satellite images.** Give each student a copy of **Log 1**. Ask the students to describe what they see in the drawing. Explain that a satellite is a small spacecraft that orbits Earth many miles above it. Some satellites have special instruments that create images of Earth. Have students color the continents green and the oceans blue and label them.
6. **Comparing maps and images from space.** Give each student **Log 2** and **Log 3**. Tell students to cut out all the boxes and place them under the correct title on the poster. Discuss the differences between satellite images and maps, and point out that the images show what is actually on the ground like a photograph while maps are human-made representations to show specific information (*political boundaries, place names, roads, vegetation regions, etc.*) about an area.
7. **Using images from space.** Satellite images can help humans understand how some things change. Tell students that NASA images are used to measure ways humans change the environment by changing how land is used. Distribute copies of **Log 4** and **Log 5** and show them as transparencies.
8. Have the students compare the images in **Log 4** with the **Log 5** transparency. The images show the rapid growth of Las Vegas, Nevada. Help students interpret the images and recognize key features. Ask students when the images were taken. How many years passed from the date the first image was captured to the second? Identify the parts of Las Vegas that were built since 1972. The images use false color. Explain that red indicates vegetation. Vegetation reflects brightly in the near infrared. Mark changes on the transparency as the students identify them.
9. Have the students answer the questions on **Logs 4** and **5**. They will measure the growth of the city over 20 years and create a map of land-use change and urban growth.

Have the students compare their answers and their maps, and discuss the value of satellite images for map making.

Concluding the Investigation

10. Have two students draw a line around Las Vegas on each of the transparencies. Overlay them and project the image on a large sheet of paper. Have two other students trace the two city boundaries on the paper. Ask a student to color the area that shows the city in 1972 and another student to color the area of growth between 1972 and 1992. Collaborate on appropriate colors, a good title for the map, and a legend explaining the boundary lines and the two colors on the map.

Discuss the importance of monitoring urban growth, especially in Las Vegas where a growing population places heavy demands on scarce water resources, and the value of satellite images in monitoring such growth.

Evaluation/Key

*Log 3:

- "It's a map!"
 - North America Map
 - Can show borders of countries
 - Can show drawings of land and water
- "It's an image from space!"
 - Satellite image of land from space
 - Can show actual landforms
 - Can show actual water bodies
 - Can show quick changes to the land

*Log 4: What do you see in this image?

2. About 16 kilometers

*Log 5: How has this place changed?

2. About 24 kilometers
3. About 8 kilometers

Related Resources

Me on the Map by Joan Sweeney, illustrated by Annette Cable (Crown Publishers, Inc., New York, 1996) ISBN 0-517-70095-6

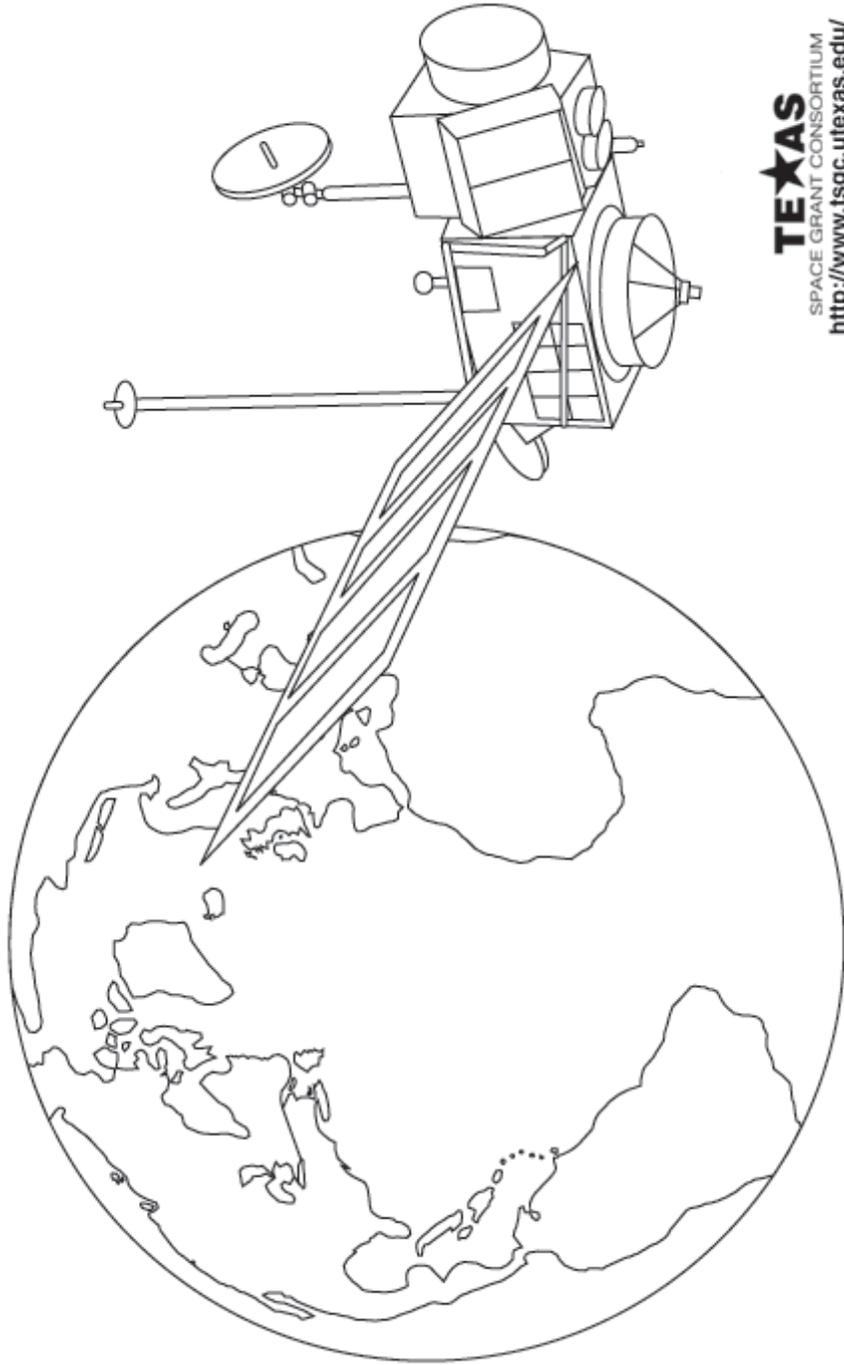
(This picture book opens with a child in her bedroom. A map of the bedroom is shown with her on the bed. The book maps the child from her bedroom to her town, in her town, in her state, in her country, and in the world.)

Looking Down by Steve Jenkins (Houghton Mifflin Co., New York, 1995) ISBN 0-395-72665-4

(This book is double-page-spread cut-paper collages that illustrate traveling from Earth into space to look at Earth. The book begins in space and then moves closer and closer to Earth. Each picture shows more details of Earth.)

Module 1, Investigation 2: Log 1

Why do we need satellites?

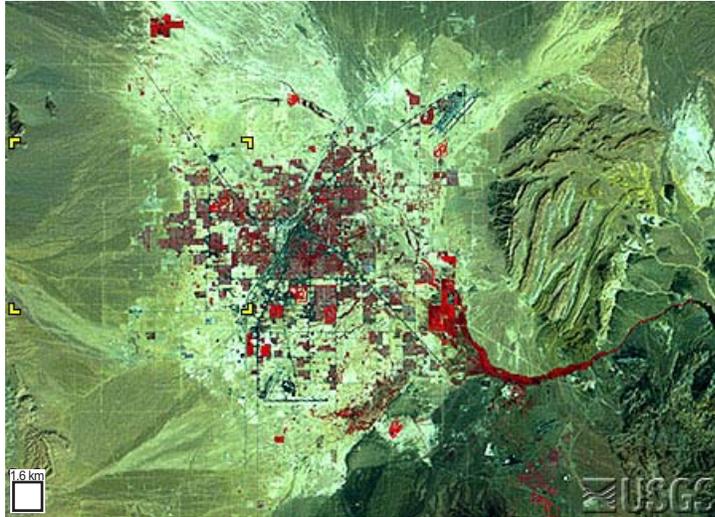


TEXAS
SPACE GRANT CONSORTIUM
<http://www.tsgc.utexas.edu/>



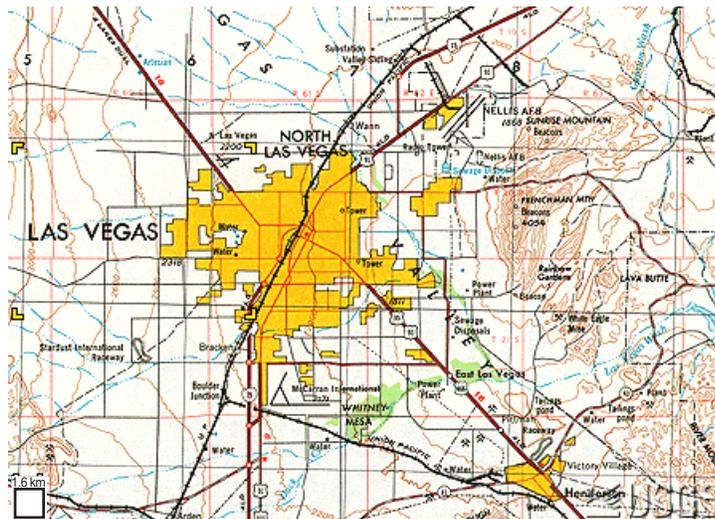
Module 1, Investigation 2: Log 2

It's a map! or It's an image—Boxes



Can show borders of countries

Can show actual water bodies



Can show actual landforms

Can show quick changes to the land

Can show drawings of land and water



Module 1, Investigation 2: Log 3

It's a map! or It's an image!—Poster

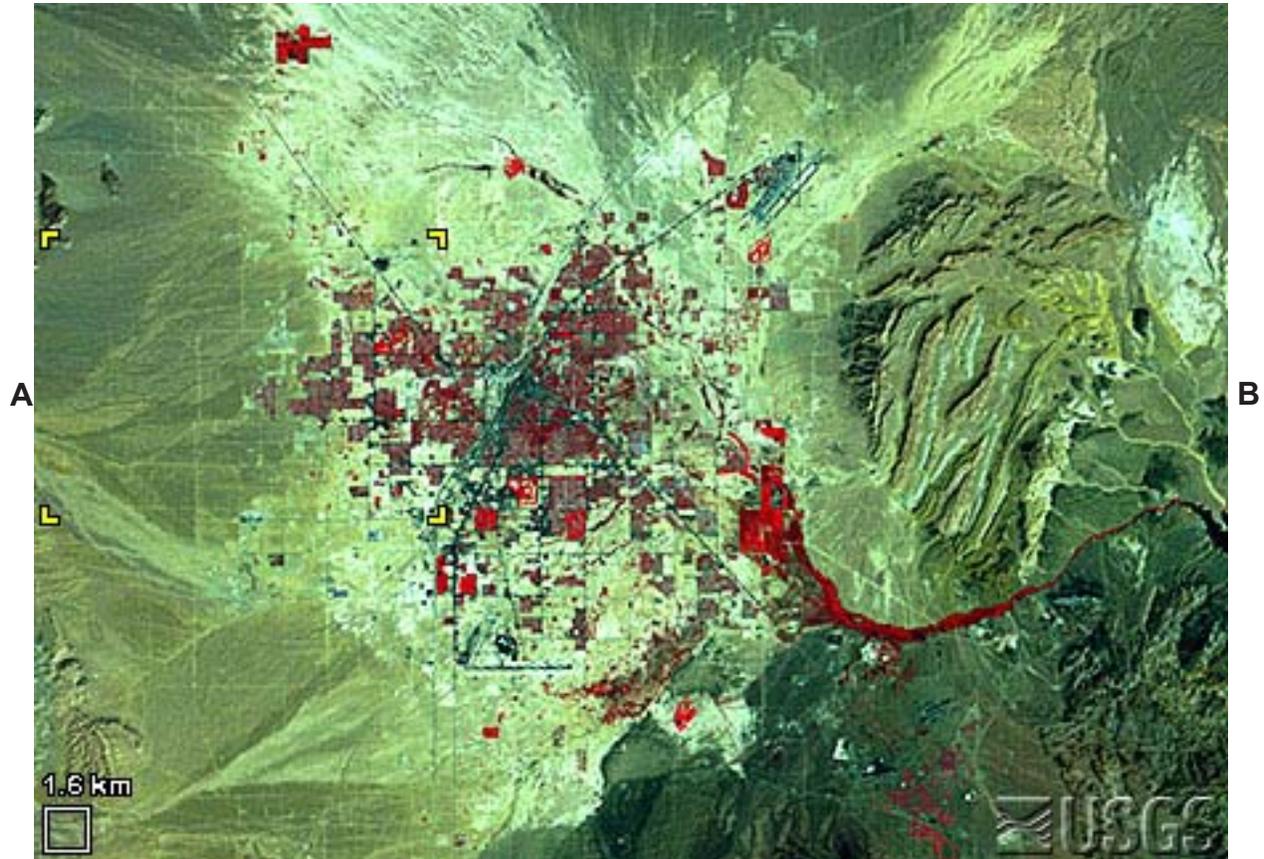
It's a Map!

It's an Image from Space!



Module 1, Investigation 2: Log 4

What do you see in this image?



Las Vegas, 1972

Source: <http://edc.usgs.gov/earthshots/slow/LasVegasa/LasVegas>

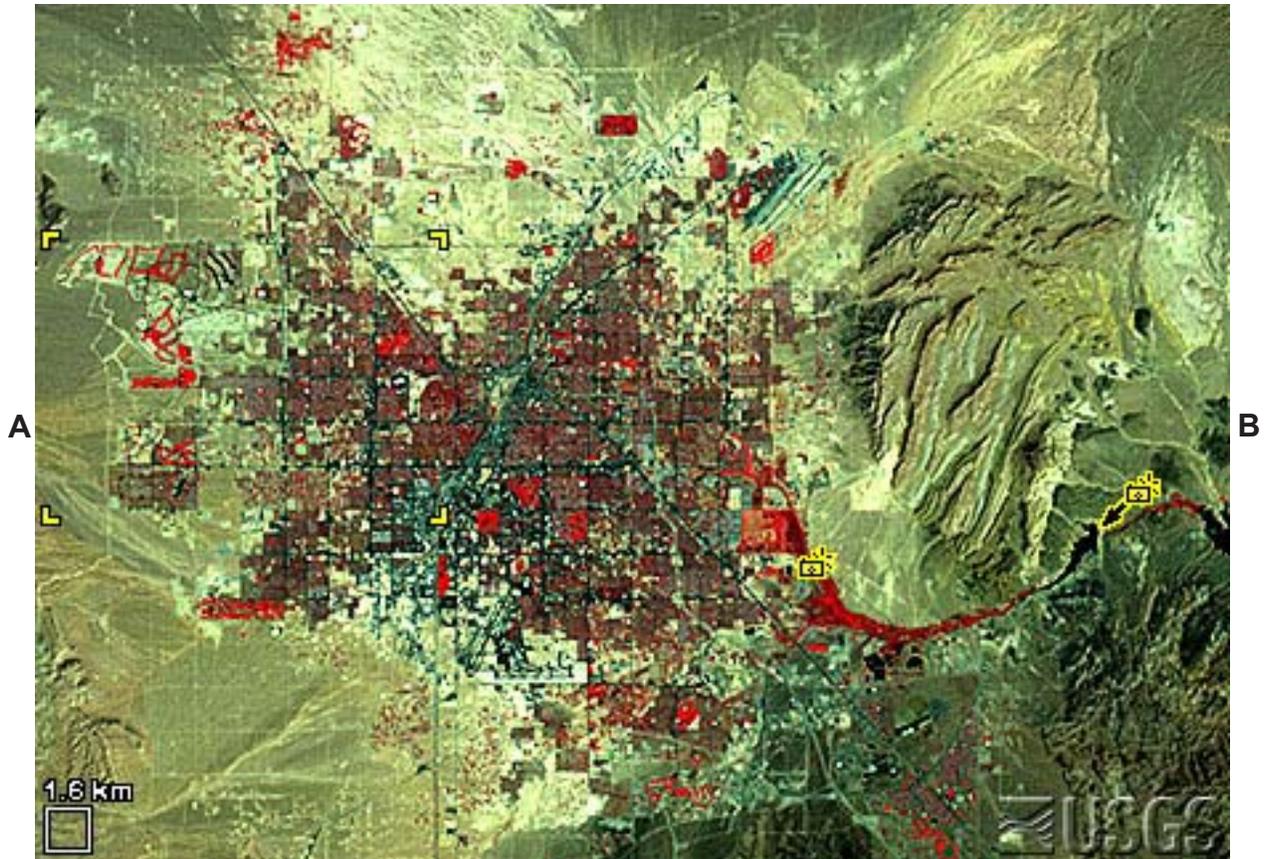
1. Draw a line around the city with a fine black marker.
2. Place a ruler between points A and B. Use the scale to figure out the distance across the city from the easternmost edge to the westernmost edge.

_____ kilometers



Module 1, Investigation 2: Log 5

How has this place changed? How do you know?



Las Vegas, 1992

Source: <http://edc.usgs.gov/earthshots/slow/LasVegas/LasVegas>

1. Draw a line around the city with a fine black marker.
2. Place a ruler between A and B. Use the scale to figure out the distance from the easternmost edge of the city to the westernmost edge.

_____ kilometers
3. How much did Las Vegas expand along this east-west line between 1972 and 1992?

_____ kilometers
4. Make this image into a map! You have already drawn a line around the city. Now use the marker to outline the highways going into Las Vegas and the streets in the city.