

RESOURCE LIBRARY
ACTIVITY : 45 MINS

Satellite Imagery and Change Over Time

Students view satellite images of places past and present and analyze the changes over time.

GRADES

5, 6

SUBJECTS

Geography

CONTENTS

5 Images, 1 Link, 1 PDF

OVERVIEW

Students view satellite images of places past and present and analyze the changes over time.

For the complete activity with media resources, visit:

<http://www.nationalgeographic.org/activity/satellite-imagery-and-change-over-time/>

DIRECTIONS

1. Discuss different ways to capture images of Earth from above.

Have a whole-class discussion about how it's possible to capture images of Earth from above. Project the satellite image of New York City and the aerial image of LaCrosse, Wisconsin. Ask: *What technologies are used to capture images of Earth from above?* Write students' ideas on the board; these may include planes, helicopters, kites or balloons with cameras, and satellites.

2. Examine the changes in Las Vegas, Nevada, and its surroundings.

Tell students that they will be looking at changes over time in different places on Earth using satellite imagery. Project the Growth in the Desert image of Las Vegas, Nevada, in 2007 and minimize the caption. Invite volunteers to point to different areas on the image as you use the prompts below. Ask:

- *Where is the city?*
- *What patterns do you see in the city? (Straight lines are streets; the layout is a grid, with some diagonal roads.)*
- *What does the land look like outside of the city? (rugged, mountainous, like a desert)*
- *What landforms do you see? (mountains, lakes)*

Point out that the black area to the east of the city is Lake Meade, a reservoir created by the damming of the Colorado River.

Next, show the side-by-side images of Las Vegas, Nevada, in 1984 and in 2007 and minimize the caption. Have students calculate the number of years between the two (23). Ask:

- *What has changed in Las Vegas, Nevada, since 1984? (The city has grown.)*
- *How much do you think the city has grown: doubled, tripled, or quadrupled? (The area of urban development looks more than four times larger in 2007 than in 1984.)*
- *How has Lake Meade changed? (It was smaller in 2007 than it was in 1984.)*
- *Why do you think the city has grown? What would attract new residents? (Answers will vary but may include abundant jobs, a growing economy, affordable housing, and an appealing climate.)*

Invite a volunteer to read aloud the caption for the paired images. Explain that the population of the city of Las Vegas grew from about 160,000 in 1970 to 600,000 in 2010. The counties surrounding the city of Las Vegas have also grown in population, so the whole urban area has spread; this is called urban sprawl. This large population uses a lot of water, so the water level in Lake Meade has become lower during this time, too. Lower rainfall levels than usual have also led to lower water levels in the lake.

3. Analyze changes in green space.

Show students the two images of the area of La Rioja, Argentina, in 1984 and 2013 (almost 30 years apart) and minimize the caption. Find the city and the mountainous area—called the Sierra del Velasco mountain range. Have a discussion about how the land has changed

between 1984 and 2013. Ask:

- *What is different in the two maps?* (The city was larger in 2013; there were more green areas outside of the city in 1984.)
- *In which direction was the growth over time, to the east or west? Why might that be so?* (Growth is to the east, because building in the mountains is more difficult than on flat land.)
- *What do you think the green spaces are? Why do you think they're so green?* (These are areas of agriculture; irrigation brings water to these areas.)

Invite a volunteer to read aloud the caption for the paired images. Have students compare the information in the caption to the class' answers.

4. Discuss the value of these satellite views of places, past and present.

Talk about how this imagery can be useful. Ask: *Who can use this imagery?* Students may have a variety of ideas; guide them to recognize that people who manage changes in cities—both government and business—can be more aware of the widespread changes to an area with views like these. People can use this imagery to plan for future agriculture, building, and land protection. They can also monitor weather and climate, and natural hazards such as fire, volcanic eruptions, flooding, and more.

Modification

If time allows, show satellite images of Earth's Physical Features. Have students guess what and where these features are, and then read the captions and find the locations on a globe or map.

Modification

In Step 1, you can also show satellite imagery of your students' town using the MapMaker Interactive.

Tip

When projecting the paired satellite images for students, use the zoom function and drag-and-drop to make sure students can see the full images.

Tip

You can use MapMaker Interactive to show students the location of these places on the world map. Talk about how this satellite imagery is different from the images they have been viewing. Certain shades of green are enhanced on the still images, while these are more “true color.”

Informal Assessment

Have students view additional past and present satellite image pairs from the Landsat Gallery, such as Manila, in the Philippines, or San Antonio, Texas. Have them work independently or in pairs to analyze the two images and create a Two-Column chart with examples of changes in the city that can be observed with satellite imagery. Have them title the chart with the location name and each column with the date.

Extending the Learning

- Have students use satellite imagery or aerial photography to analyze change in their hometown or state. Contact your local or state historical society to request digital images that students can use to compare and contrast with what they see on the National Geographic MapMaker Interactive’s satellite base layer. Have students create a poster showing changes in their state’s or town’s development over the past three or four decades. For more recent changes, students can also use [Google Earth’s historical imagery](#) (select the clock icon at top) to view changes to the local landscape in roughly the last decade.
- Invite a city planner to speak to your class in person or via videoconference, and request in advance that they talk about the use of satellite imagery as part of the planning process. Ask them to show examples of using satellite imagery and other mapping technologies in their work.
- For an engineering activity, have students research and build a tool to do aerial photography with kite or balloon mapping. [Click here](#) for tips on how to build one.
- Have students research other areas where analyzing satellite imagery over time has been very important, such as in disaster relief, human rights monitoring, and combating invasive species.

OBJECTIVES

Subjects & Disciplines

Geography

Learning Objectives

Students will:

- analyze features shown on satellite images
- analyze changes over time using satellite imagery

Teaching Approach

- Learning-for-use

Teaching Methods

- Discussions
- Visual instruction

Skills Summary

This activity targets the following skills:

- 21st Century Student Outcomes
 - Learning and Innovation Skills
 - Communication and Collaboration
- Critical Thinking Skills
 - Understanding
- Geographic Skills
 - Analyzing Geographic Information

National Standards, Principles, and Practices

NATIONAL COUNCIL FOR SOCIAL STUDIES CURRICULUM STANDARDS

- **Theme 2:**

Time, Continuity, and Change

- **Theme 3:**

People, Places, and Environments

NATIONAL GEOGRAPHY STANDARDS

- **Standard 1:**

How to use maps and other geographic representations, geospatial technologies, and spatial thinking to understand and communicate information

- **Standard 14:**

How human actions modify the physical environment

- **Standard 3:**

How to analyze the spatial organization of people, places, and environments on Earth's surface

- **Standard 4:**

The physical and human characteristics of places

THE COLLEGE, CAREER & CIVIC LIFE (C3) FRAMEWORK FOR SOCIAL STUDIES STATE STANDARDS

- **Geographic Representations: Spatial Views of the World: D2.Geo.2.3-5:**

Use maps, satellite images, photographs, and other representations to explain relationships between the locations of places and regions and their environmental characteristics.

- **Geographic Representations: Spatial Views of the World: D2.Geo.2.6-8:**

Use maps, satellite images, photographs, and other representations to explain relationships between the locations of places and regions, and changes in their environmental characteristics.

- **Human-Environment Interaction: Place, Regions, and Culture: D2.Geo.5.3-5:**

Explain how the cultural and environmental characteristics of places changes over time.

Preparation

What You'll Need

MATERIALS YOU PROVIDE

- Paper
- Pencils, pens

REQUIRED TECHNOLOGY

- Internet Access: Required
- Tech Setup: 1 computer per classroom, 1 computer per pair, Projector

PHYSICAL SPACE

- Classroom

GROUPING

- Large-group instruction

BACKGROUND & VOCABULARY

Background Information

Satellite imagery has dramatically changed how we look at Earth's surface from above. The U.S. government first launched its Landsat satellites in the early 1970s to capture data about the global landscape. Prior to 1970, aerial photography from airplanes was the common method for acquiring images of Earth's surface. Areas that could be photographed from a plane, though, were on a much smaller scale than images that could be created from satellites moving out in space.

The Landsat satellites have captured images of Earth since 1972. These give a long-term record of both natural and human-induced changes on Earth's surface. Comparing and contrasting images from different years shows both slow, subtle changes and also rapid and devastating ones.

Prior Knowledge

Recommended Prior Activities

- None

Vocabulary

Term	Part of Speech	Definition
aerial imagery	<i>noun</i>	photographs, maps, and other visual information based on visual data taken from high in the atmosphere, usually in a plane.
agriculture	<i>noun</i>	the art and science of cultivating land for growing crops (farming) or raising livestock (ranching).
climate	<i>noun</i>	all weather conditions for a given location over a period of time.
irrigation	<i>noun</i>	watering land, usually for agriculture, by artificial means.
landform	<i>noun</i>	specific natural feature on the Earth's surface.
map skills	<i>noun</i>	skills for reading and interpreting maps, from learning basic map conventions to analyzing and comprehending maps to address higher-order goals.
mountain range	<i>noun</i>	series or chain of mountains that are close together.
natural hazard	<i>noun</i>	event in the physical environment that is destructive to human activity.
population	<i>noun</i>	total number of people or organisms in a particular area.
satellite	<i>noun</i>	object that orbits around something else. Satellites can be natural, like moons, or artificial.
satellite imagery	<i>noun</i>	photographs of a planet taken by or from a satellite.
urban	<i>adjective</i>	having to do with city life.
urban sprawl	<i>noun</i>	unplanned low-density development surrounding an urban area that often starts as rural land. Also called suburban sprawl.

For Further Exploration

Images

- [National Geographic Education: Collection—Satellite Imagery](#)

Websites

- [NASA Earth Observatory: How to Interpret a Satellite Image](#)
- [USGS: Tracking Change Over Time](#)
- [Growth of Las Vegas, Nevada](#)



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