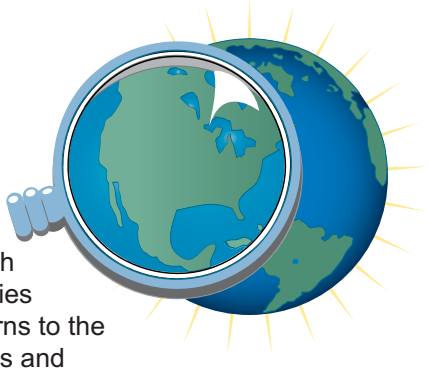
Where are the cities?



Investigation Overview

Students compare an image showing nighttime lights in the United States with atlas maps in order to identify major cities and relate population distribution patterns to the physical environment. By locating cities and physical features identified in the nighttime image on an outline map, students become more familiar with important locations in the United States. They also use atlas maps and geographic information to identify NASA images of areas around several major cities.

Time required: Two 45-minute sessions

Materials/Resources

Atlas maps or U.S. wall maps showing landforms and vegetation
Outline map of the United States (copy for each student)
Figure 1: Nighttime lights of the continental United States (make an overhead transparency and one copy for each group of 3 students)
Log 1: Understanding the nighttime lights (one for each group of 3)
Log 2: Where are these cities?—Questions (one for each group of 3)
Log 3: Where are these cities?—Space Shuttle photographs (one for each group of 3)
Light blue crayon, red crayon

Content Preview

Population in the United States is unevenly distributed. Physical features such as mountains and deserts have discouraged settlement in some areas while features such as lakes, rivers, and coastlines make other locations more attractive to settlers. The United States is more densely populated in the East because of historical settlement patterns and physical geography.

Classroom Procedures

Beginning the Investigation

1. Distribute outline maps of the United States to each student and speculate with the students about where in the United States most people live. Ask them where they think the big cities are located.

2. Tell students that in earliest times people lived in rural areas and small communities. Explain how the growth of industry enabled some of these communities to grow into big cities. Explain that there were several reasons why sites developed into cities. Ask the students to think of reasons why specific places make good sites for cities. (*Protected harbor, fresh water available, easy to reach, easy to defend, streams or river for water power and transportation, raw materials for industry, etc.*)

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.

Standard 5: Places and Regions

That people create regions to interpret Earth's complexity

- Predict the consequences of a specific physical process operating on Earth's surface.

Developing the Investigation

3. Divide the class into groups of three. Give each group an atlas and a copy of **Figure 1** and **Log 1**. Ask the students what they think the white areas represent. (*They are lights that have been identified by satellites. They show where large towns and cities are located.*) Use the information in the Background section for more details, as appropriate. Explain that larger areas of light mean larger cities. Ask the students to describe how the U.S. population is distributed. (*More people in the eastern half; most along the coastlines, etc.*) Tell students to try to find the location of their home town on this map. Ask them if it is in a white area or a dark area.

4. Ask each group to use **Figure 1**, an outline map of the United States, and their atlases to answer the questions in **Log 1**. Have the whole class discuss the answers.

Concluding the Investigation

5. **Where are these cities?** Keep students in their groups and tell them that they will continue to use the atlas, the map, and **Figure 1**. Give each group a copy of **Log 2** (Where are these cities?—Questions), and **Log 3** (Where are these cities?—Space Shuttle photos). Write the names of the cities on the board: Boston, Massachusetts; Detroit, Michigan; Pittsburgh, Pennsylvania; San Francisco, California; Minneapolis, Minnesota; and Miami, Florida. Have students locate these cities in the atlas and follow the directions in **Log 2**, questions 1 and 2. Then explain that the clues in question 3 refer to the images in **Log 3**. Explain that these are Space Shuttle images that show the physical environments around each city. Ask the students to use the clues and their atlases to identify each city. After the students have identified the cities, discuss the physical features that might have contributed to making each city a good settlement site.

Evaluation

Answer Key

Log 1: Understanding the Nighttime Lights

2. To the east
3. Minneapolis, St. Louis
5. Easy transportation on the lakes, water for people and industry
9. The lights come together
10. Chicago, Milwaukee

Log 3: Where are these cities?—Space Shuttle photographs

a. San Francisco, California
b. Boston, Massachusetts
c. Detroit, Michigan
d. Miami, Florida
e. Pittsburgh, Pennsylvania
f. Minneapolis, Minnesota

Background

On the nighttime lights of the continental United States image: light is evidence of towns and cities; dark means the absence of towns and cities. You will see great clusters of cities from Boston to New York, Philadelphia, Baltimore, and Washington. This is the original megalopolis. The nighttime lights of the world dataset contains the first satellite-based global inventory of human settlements, derived by nighttime data obtained by the Defense Meteorological Satellite Program (DMSP) and Operational Linescan System (OLS). The DMSP-OLS has the unique capability to observe faint sources of visible-near infrared emissions present at Earth's surface, including cities, towns, villages, gas flares, and fires. Lights in the Gulf of Mexico are flares from the burn-off of oil and natural gas fields.

Resources

http://julius.ngdc.noaa.gov:8080/production/html/BIOMASS/usa.html Nighttime lights of continental United States

http://svs.gsfc.nasa.gov/imagewall/LandSat/boston.html Boston, Massachusetts

http://svs.gsfc.nasa.gov/imagewall/LandSat/detroit.html Detroit, Michigan

http://svs.gsfc.nasa.gov/imagewall/LandSat/pittsburgh.html Pittsburgh, Pennsylvania

http://svs.gsfc.nasa.gov/imagewall/LandSat/downtown_minneapolis.jpg Minneapolis, Minnesota

http://svs.gsfc.nasa.gov/imagewall/LandSat/san_francisco.html San Francisco, California

http://svs.gsfc.nasa.gov/imagewall/LandSat/miami.html Miami, Florida

Module 3, Investigation 4: Figure 1

Nighttime lights of the continental United States

Name _____ Date _____

Source: http://julius.ngdc.noaa.gov:8080/production/html/BIOMASS/usa.html

Module 3, Investigation 4: Log 1

Understanding the nighttime lights

1. Draw a blue line on the outline map where the Mississippi River is located. (Find the location in the atlas.)

2. Figure out where the Mississippi River is on the image and draw a blue line there, too. Are there more cities to the east or west of the Mississippi River?

   _____

3. Color the two brightest lights along the Mississippi River red. Use the atlas to find out which two cities you picked.

   _____ _____

4. Make a small circle to show each city on the outline map and label them.

5. Color the Great Lakes blue on the outline map and label them. Use the atlas to find the big cities on each lake. Mark and label them on the map. Circle these cities in Figure 1. Why do you think cities developed along the Great Lakes?

   _____

6. Find the Rocky Mountains, the Appalachian Mountains, the Sierra Nevada Mountains, the Cascades Range, and the Coastal Ranges in the atlas. Label them on the outline map.

7. Find the desert areas of the west and southwest in the atlas. Mark and label them on the outline map.

8. Can you find the mountains and the dry areas in the nighttime image? Circle them with the blue crayon.

9. A megalopolis is a giant city. It occurs when individual cities grow so big that they merge together. Locate Boston, New York City, Philadelphia, Baltimore, and Washington, D.C., in the atlas. Mark and label them on the map and color them red on the image. What pattern do you see on the image?

   _____

10. Find another megalopolis on the image at the south end of Lake Michigan and color it red. Mark and label two cities in this megalopolis on the map.

    _____ _____

Module 3, Investigation 4: Log 2
Where are these cities?—Questions

Name _____ Date _____

Geographers, scientists, and planners are just a few of the people who look at population and ask, “Where are people? Where are the cities?” Now it’s your turn to look at a map that shows us many cities and decide what makes some places good for large and dense settlements. To do this, complete the investigation below:

1. Images on Log 3 are of the following cities:
   Boston, Massachusetts
   Detroit, Michigan
   Pittsburgh, Pennsylvania
   San Francisco, California
   Minneapolis, Minnesota
   Miami, Florida

2. Locate these cities in the atlas. Then mark and label them on your outline map. Circle them on the nighttime image (Figure 1).

3. Look at the NASA images of these cities in Log 3 and see if you can identify them. Use the atlas and the clues below to help you match the cities and the images. Write the name of each city in the space next to the image.

   a. This city is on a bay on the Pacific Ocean.

   b. This city is in New England, on Massachusetts Bay.

   c. This city is on a river between Lake Huron and Lake Erie.

   d. This city is in the southeastern United States on the Atlantic Ocean.

   e. This city is located west of the Appalachian Mountains where the Ohio and Allegheny Rivers meet to form the Monongahela River.

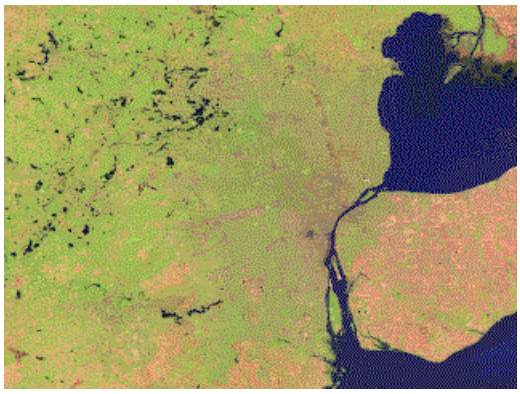
   f. This city is the northernmost port on the Mississippi River.

Module 3, Investigation 4: Log 3

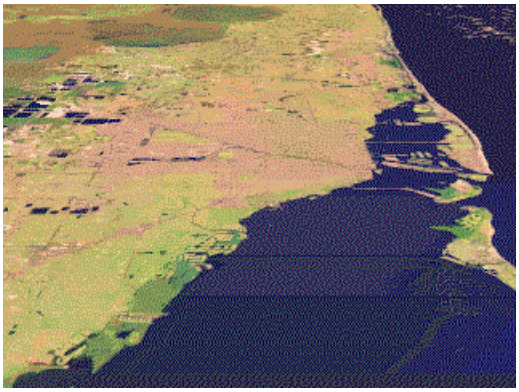
Where are these cities?—Space Shuttle photographs

a. _____

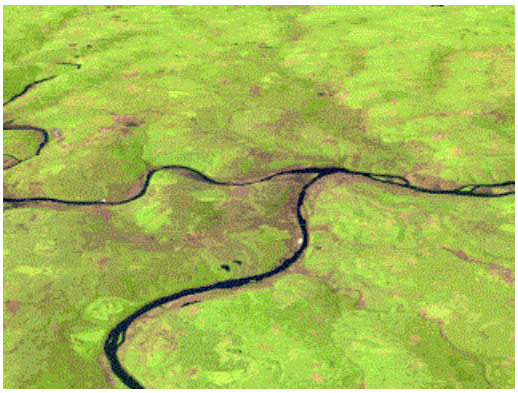
b. _____



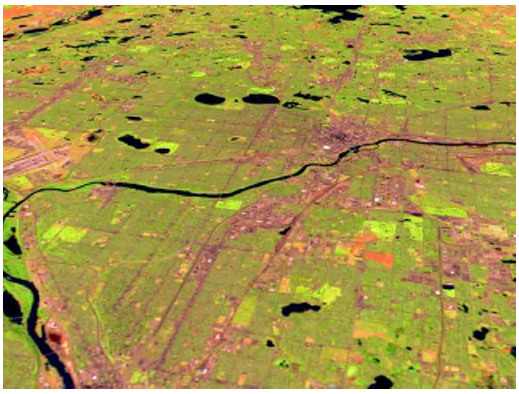
c. _____



d. _____



e. _____



f. _____