

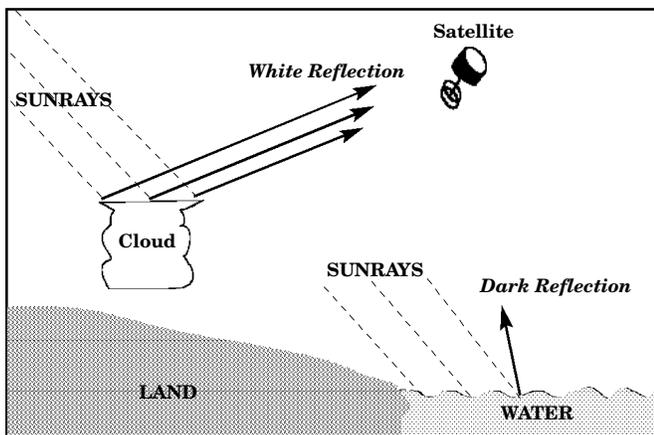
17. Satellite Images

OBJECTIVES: After completing this lesson, a student should be able to:

- * **Explain how a satellite image is taken**
- * **Identify a VISIBLE satellite image**
- * **Describe an INFRARED satellite image (Grades 4-8)**

TEACHER BACKGROUND: (Grades 1-8)

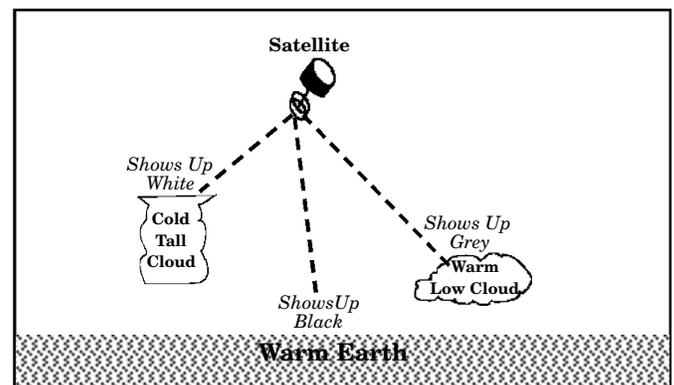
All grade levels can relate to one type of satellite image because it's much like a regular photograph. It is called a *visible* image. **A VISIBLE SATELLITE IMAGE, taken only in daylight, shows sunlight reflecting off of clouds near the earth's surface.** To produce a visible image, satellites use cameras to detect the sunlight reflected from the clouds. Since clouds are excellent reflectors of light, they appear white, while land masses and water of the oceans appear darker. Satellites broadcast the visible data to Earth where a black and white "photograph" is constructed.



Visible images show the daytime cloud cover on Earth, and they assist with the mapping of ice within the shipping channels of the polar regions and the Great Lakes. Visible images also detect valuable data about Northern Hemisphere snow cover and monitor the conditions of vegetation. Polar orbiting satellites record the global data they collect and broadcast the data as they pass over one of the two receiving stations located in Alaska and Virginia.

Additional notes for grades 4-8:

Satellites can provide an image of the weather day or night, when sunlight is no longer available. These images are called *infrared*. **AN INFRARED SATELLITE IMAGE, taken day or night, shows the pattern of heat (or infrared radiation) released from the earth.** Chances are, images you see on the late evening television weather broadcast are infrared images. The earth radiates heat into space all the time. Infrared imagery shows different temperatures in black, white and shades of grey. The coldest temperatures show up as white and the warmest as black. Since the tops of high clouds are very cold, those clouds show up on the infrared image as white. Lower clouds in the atmosphere are warmer, so they show up as a darker shade of grey on the infrared image. (See figure below.)



Computers can process infrared images to show temperatures of specific clouds and assign colors to different temperatures. Computers process an infrared image in color to locate and track cold, tall thunderstorm clouds across the country, day or night.

Satellite Image Activity

GRADES 1-3

INTRODUCTORY: *VISIBLE REFLECTION*

To illustrate the concept of light reflecting from clouds, students can design and cut out their own reflecting cloud from a piece of aluminum foil. Wrap the foil around a matching piece of cardboard, shiny side out. Tie a string to each cloud for hanging near a sunny window or near a student's own satellite created in the previous lesson.

ADVANCED: *VISIBLE CLASSROOM*

Divide students into three groups, asking students in each group to construct (on colored paper) an all *blue* water scene, *green* land scene or *white* cloud scene. Assemble the students, each holding their color project. Explain that you are a satellite taking a visible image. As you "scan" the room, which scenes (colors) can the satellite "see" best? (white)

GRADES 4-8

INTRODUCTORY: *INFRARED COLOR*

This activity demonstrates how colors absorb and radiate heat. Place large pieces of different colored paper on the ground in the sun and a thermometer in the center of each. After 10 minutes, record the temperatures. Which colors are warmest? (darkest) Which color radiates the most infrared radiation (heat) to space? (black) Which color would represent clouds? (white) Why?

ADVANCED: *VISIBLE IMAGE*

This activity compliments the Part II exercise below. Duplicate and distribute the visible satellite image of worksheet #3. Can students identify the thickest clouds? (solid white) Where are skies partly cloudy? (where you see only bits of white) Can you find cirrus clouds looking as if they were painted with a brush? (over Wisconsin, the Chicago, IL area and Indiana)

SATELLITE IMAGE EXERCISE - Part II (Time: 15-20 minutes) (GRADES 1-8)

Materials: Worksheet #3 (satellite image), markers or crayons

Preparation: Duplicate and distribute image.

Procedure: (GRADES 1-3) Place an "X" over a familiar location, a "C" for cloudy over states with white clouds and "S" for sunny over dark, (clear) states. (GRADES 4-8) Identify geography, label "cloudy" and "sunny" states.

Evaluation: (GRADES 1-3) Draw a yellow sun over areas of clear skies, and draw rain or snow symbols over clouds. Does the image match their worksheet #2? (It should; it was the same day!) (GRADES 4-8) Place a blue "H" over regions of fair weather. (Eastern and Southwest U.S.) Place a red "L" over Kansas. This image matches the weather map worksheet #2 data. How well did students do in their Part I cloud outline estimates? Collect worksheet #3 and place with #2.

Excursion: Can students see the counterclockwise circulation of clouds around the Kansas LOW?

Computer: (Grades 4-8) Identify high and low pressure areas on the satellite images.

WEATHERSCHOOL QUESTION:

Obtain the question and correct answer from your local Weatherschool TV channel!