

Student Guide

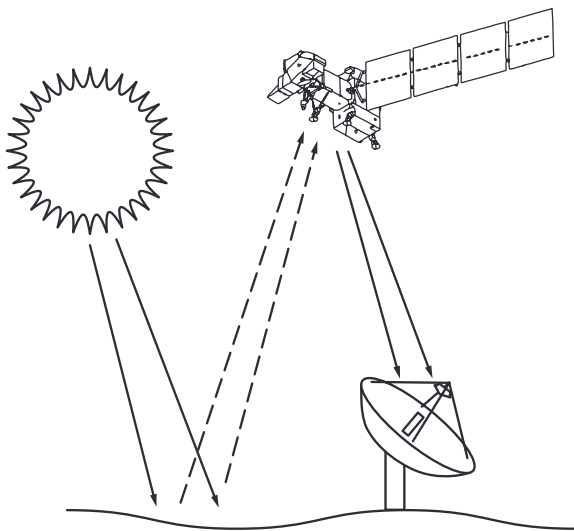
Tracking Change Over Time—Understanding Remote Sensing

1. What is remote sensing?

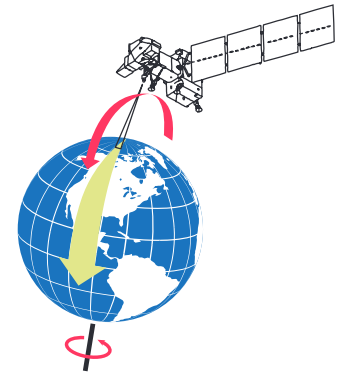
Remote sensing means observing something from a distance. Satellites in space observe the Earth from a distance and help scientists study large tracts of land and how that land changes over time.

Optical remote sensing satellites use reflected light to detect electromagnetic energy on the Earth's surface. The level of energy is represented by the electromagnetic spectrum, which is the range of energy that comes from the Sun. The light from the Sun that we can see is only a small part of the electromagnetic spectrum and includes the colors of the rainbow. Satellite sensors can detect light that we can't see.

The electromagnetic energy reflects off the Earth's surface and up to the satellite sensor, which collects and records information about that energy. That information is transmitted to a receiving station in the form of data that are processed into an image.



While there are many Earth-observing satellites, these lessons focus on the Landsat series of satellites. The Landsat satellites are in a polar orbit, which, along with the Earth's rotation, allows them to image most of the Earth. As a Landsat satellite revolves around the Earth, its sensor "sees" a certain portion of the Earth's surface. As the satellite orbits the Earth from pole to pole, it appears to move from east to west because of the Earth's rotation. This apparent movement allows the satellite to view a new area with each orbit.



Landsat Uses:

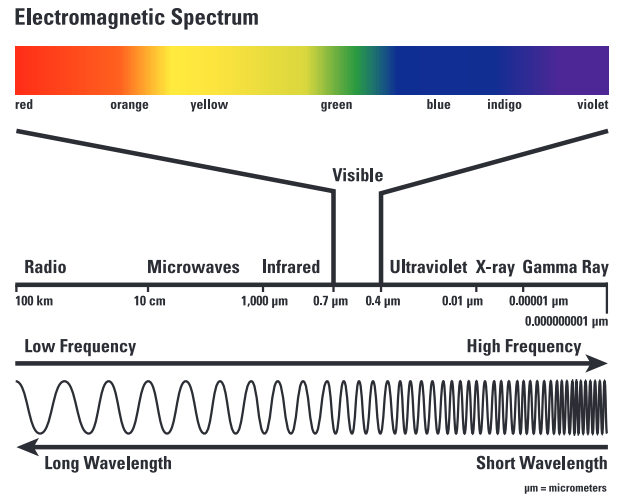
- Geographers look for changes on the Earth's surface that need to be mapped.
- Foresters need information about what type of trees are growing and if they have been affected by disease, fire, or pollution.
- Environmental scientists detect, identify, and follow the movement of pollutants such as oil slicks on the ocean.
- Geologists are interested in finding valuable minerals.
- Farmers monitor how crops are growing and if they have been affected by drought, floods, disease, or pests.
- Ship captains plot the best route through polar ice packs.
- Firefighters send out crews based on information about the size and movement of a forest fire.

2. How do satellite sensors work?

We can only see an object because light bounces off of it and to our eyes. Human eyes can detect only visible light—the colors of the rainbow. Satellite sensors can also detect ultraviolet and infrared light.

The sensors record this information in different portions of the electromagnetic spectrum, which is measured in wavelengths. Landsat satellite sensors detect both visible and infrared light.

When satellite images are made, these “invisible” types of light are assigned visible colors to represent them. That is why some satellite images have strange colors.



3. What can you see in a satellite image?

In this image of Bellingham, Washington, you can see a river (A), urban areas (B), agricultural areas (C), and forest (D). See if you can find the following features in the image:

- airport
- river sediment
- bay
- lake
- major streets
- highway
- logging clear-cut areas
- golf course
- cleared area for power lines

