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| **III. Why do Geographers use maps, and what do maps tell us? 15-21** |
| What is cartography? |  |
| What do reference maps show? |  |
| What do thematic maps show? |  |
| What is GPS? |  |
| What is geocaching? |  |
| Explain the term “relative location.” |  |
| **IIIC. Remote Sensing and GIS 17-21** |
| How do geographers use remote sensing to monitor the earth? |  |
| What is Google earth? |  |
| What is GIS? |  |
| How do geographers use GIS? |  |
| How do political geographers use GIS? |  |
| What kind of industries do students with geography degrees work? |  |
| How does GIS help geographers answer complicated questions? |  |
| What is GISci? |  |

**DIRECTIONS**: Use your textbook and the information given below to answer the questions about the geography tools listed below.

**An Overview of Remote Sensing**Remote sensing is the examination or the gathering of information about a place from a distance. Such examination can occur with devices (e.g. - cameras) based on the ground, and/or sensors or cameras based on ships, aircraft, satellites, or other spacecraft.

Today, the data obtained is usually stored and manipulated using computers. The most common software used in remote sensing is ERDAS Imagine, ESRI, MapInfo, and ERMapper.

**A Brief History of Remote Sensing**

Modern remote sensing began in 1858 when Gaspard-Felix Tournachon first took aerial photographs of Paris from a hot air balloon. Remote sensing continued to grow from there; one of the first planned uses of remote sensing occurred during the U.S. Civil War when messenger pigeons, kites, and unmanned balloons were flown over enemy territory with cameras attached to them.

The first governmental-organized air photography missions were developed for military surveillance during World Wars I and II but reached a climax during the Cold War.

Today, small remote sensors or cameras are used by law enforcement and the military in both manned and unmanned platforms to gain information about an area. Today's remote sensing imaging also includes infra-red, conventional air photos, and Doppler radar.

In addition to these tools, satellites were developed during the late 20th century and are still used today to gain information on a global scale and even information about other planets in the solar system. For example, the Magellan probe is a satellite that has used remote sensing technologies to create topographic maps of Venus.

**Types of Remote Sensing Data**

The types of remote sensing data vary but each plays a significant role in the ability to analyze an area from some distance away. The first way to gather remote sensing data is through radar. Its most important uses are for air traffic control and the detection of storms or other potential disasters. In addition, Doppler radar is a common type of radar used in detecting meteorological data but is also used by law enforcement to monitor traffic and driving speeds. Other types of radar are also used to create digital models of elevation.

Another type of remote sensing data comes from lasers. These are often used in conjunction with radar altimeters on satellites to measure things like wind speeds and their direction and the direction of ocean currents. These altimeters are also useful in seafloor mapping in that they are capable of measuring bulges of water caused by gravity and the varied seafloor topography. These varied ocean heights can then be measured and analyzed to create seafloor maps.

Also common in remote sensing is LIDAR - Light Detection and Ranging. This is most famously used for weapons ranging but can also be used to measure chemicals in the atmosphere and heights of objects on the ground.

Other types of remote sensing data include stereographic pairs created from multiple air photos (often used to view features in 3-D and/or make topographic maps), radiometers and photometers which collect emitted radiation common in infra-red photos, and air photo data obtained by earth-viewing satellites such as those found in the [Landsat](http://geography.about.com/od/geographictechnology/a/landsat.htm) program.

**Applications of Remote Sensing**

As with its varied types of data, the specific applications of remote sensing are diverse as well. However, remote sensing is mainly conducted for image processing and interpretation. Image processing allows things like air photos and satellite images to be manipulated so they fit various project uses and/or to create maps. By using image interpretation in remote sensing an area can be studied without being physically present there.

The processing and interpretation of remote sensing images also has specific uses within various fields of study. In geology, for instance, remote sensing can be applied to analyze and map large, remote areas. Remote sensing interpretation also makes it easy for geologists in this case to identify an area's rock types, [geomorphology](http://geography.about.com/od/physicalgeography/a/geomorphology.htm), and changes from natural events such as a flood or landslide.

Remote sensing is also helpful in studying vegetation types. Interpretation of remote sensing images allows physical and biogeographers, ecologists, those studying agriculture, and foresters to easily detect what vegetation is present in certain areas, its growth potential, and sometimes what conditions are conducive to its being there.

Additionally, those studying urban and other land use applications are also concerned with remote sensing because it allows them to easily pick out which land uses are present in an area. This can then be used as data in city planning applications and the study of species habitat, for example.

Finally, remote sensing plays a significant role in [**GIS**](http://geography.about.com/od/geographyintern/a/gisoverview.htm)**.** Its images are used as the input data for the raster-based digital elevation models (abbreviated as DEMs) - a common type of data used in GIS. The air photos taken during remote sensing applications are also used during GIS digitizing to create polygons, which are later put into shapefiles to create maps.

Because of its varied applications and ability to allow users to collect, interpret, and manipulate data over large often not easily accessible and sometimes dangerous areas, remote sensing has become a useful tool for all geographers, regardless of their concentration.

**Global Positioning System**

**Eight Things You Need to Know About GPS**

By Matt Rosenberg, About.com Guide

Global Positioning System (GPS) devices can be found everywhere - they're used in cars, boats, airplanes, and even in cellular phones. Handheld GPS receivers are carried by hikers, surveyors, map makers, and others who need to know where they are. Here are the eight most important things you need to know about the GPS.

 \* The Global Positioning System is composed of twenty-four satellites 20,200 km (12,500 miles or 10,900 nautical miles) above the earth. The satellites are spaced in orbit so that at any time a minimum of six satellites will be in view to users anywhere in the world. The satellites continuously broadcast position and time data to users throughout the world.

 \* Using a portable or handheld receiver unit that receives data from the closest satellites, the GPS unit triangulates the data to determine the unit's exact location (typically in latitude and longitude), elevation, speed, and time. This information is available around-the-clock anywhere in the world and is not dependent on weather.

 \* Selective Availability, which made the public Global Positioning System less accurate than the military GPS, was turned off on May 1, 2000. Thus, the GPS unit you can buy over the counter at many retailers is as accurate as those used by the military today.

 \* Many over-the-counter handheld Global Positioning System units contain base maps of a region of the earth but most can be hooked up to a computer to download additional data for specific locales.

 \* GPS was developed in the 1970s by the U.S. Department of Defense so that military units can always know their exact location and the location of other units. The Global Positioning System (GPS) helped the United States win the war in the Persian Gulf in 1991. During Operation Desert Storm, military vehicles relied on the system to navigate across the barren desert at night.

 \* Global Positioning System is free to the world, developed and paid for by U.S. taxpayers through the U.S. Department of Defense.

 \* Nonetheless, the U.S. military maintains the capability to prevent enemy use of GPS.

 \* In 1997, U.S. Secretary of Transportation Federico Pena stated, "Most people don't know what GPS is. Five years from now, Americans won't know how we lived without it." Today, Global Positioning System in included as part of in-vehicle navigation systems and cellular phones. It's taken a few more than five years but I know the rate of Global Positioning System use will continue to explode.

EXTRA CREDIT: Watch this video: <https://www.youtube.com/watch?v=WENSZ1XRe7I&list=PLRfQxASW3zdWzfp9drdOkQydRXhLBkuBh&index=29>

And this one

<https://www.youtube.com/watch?v=M7tK9CjRmIo&list=PLRfQxASW3zdWzfp9drdOkQydRXhLBkuBh&index=28>

* Write a short review of how GPS and GIS are used in 1) everyday life and 2) careers.
* You must use grade-level vocabulary and academic and content language.