American Museum of Natural History
Center for Biodiversity and Conservation

What you need to know when searching for satellite imagery

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What you need to know when searching for satellite imagery

Selecting the right imagery for a particular task can seem like a very complex undertaking. However, with a little practice it is pretty easy to narrow the choices from dozens of image types to just a few. The best way to decide what will work is to talk with other users who have addressed similar issues. Using various remote sensing resources on the Internet such as e-mail list servers or contacting a university or other organization working with satellite imagery, you can get valuable advice for selecting appropriate imagery. Using a table such as the ITC database of satellites and sensors can be helpful to quickly narrow your selection pool. However, you must understand the terminology to make an appropriate choice.

Often the most limiting factor is the money available to purchase imagery. The price for satellite imagery can range from nothing to over $50/square kilometer. Although the table mentioned above lists the approximate pricing for the different products, the pricing schemes used by the various vendors change and they can be a little difficult to understand. It is always a good idea to look at the vendor's web site or to contact the vendor to find out how their products are priced. There are some great archives offering free satellite imagery, but most of that imagery is either from the Landsat series of satellites or it is coarse (less the 250 m resolution) resolution.

In the remainder of this section we will describe other variables associated with different satellite image products to make it a little easier to decipher information provided by satellite image vendors.

Spatial Resolution

This refers to the size of a pixel in terms of ground dimensions. It is usually presented as a single value that represents the length of one side of a square. For example, a spatial resolution of 30 meters means that one pixel represents an area of 30 meters by 30 meters on the ground. If the pixel is rectangular it will be represented by a height and width dimension (i.e., 56m x 79m).

So, how does one select an appropriate spatial resolution? Although there are guidelines for selecting an appropriate spatial resolution most people rely on experience, and trial and error. If you can't tap into someone with sufficient experience try to select a resolution that is a factor of 10 times the size of the features you are identifying. For example, if you want to visually delineate features with a minimum size (minimum mapping unit) of 1 hectare (100m x 100m), a 30m spatial resolution is probably sufficient but if you want to identify tree crowns that are roughly 3m x 3m you would probably want to select a 1m or finer resolution.

Use the multiple scale interactive tool to compare the spatial resolution of different satellite images.

Spectral Bands (channels)

When evaluating the spectral quality of a particular image product there are three variables

that are usually considered:

- bandwidth
- band placement, and
- the number of bands

The **spectral bandwidth** refers to the range of wavelengths that are detected by a particular sensor. This characteristic is particularly important when using hyperspectral imagery.

Band placement defines the portion of the electromagnetic spectrum that is used for a particular image band. For example, one channel might detect blue wavelengths and another channel might detect thermal wavelengths. The particular properties of the features you are interested in dictate which bands are important. To get a better understanding for which bands are most useful for specific features, you can look at the band combinations guide.

The last spectral variable is the **number of bands**. This is generally less important for visual interpretation since we are only interested in using 3 bands at a time, but it can become important when using automated classification approaches. Image products with many bands (usually over 100) are called hyperspectral images.

Take a look at the spectral curve interactive tool to compare the band characteristics of different sensors.

Program History

It is important to know the background of a satellite sensor (or its program history) if you want to be able to obtain imagery that was acquired several years ago. Some satellite image programs, such as Landsat, were started over 30 years ago whereas others, such as Quickbird, started in 2001.

Image Surface Area

The area covered by an image product defines the dimensions of the image. Usually, high spatial resolution images cover less ground per image than the lower resolution images but this is not always the case. Having images that cover large areas increases your chances of covering your area of interest in the fewest number of scenes possible. Stitching together adjacent images can be problematic, especially if the adjacent images were acquired during different seasons. Having your entire study area on a single image saves a lot of work. The Image footprint comparison interactive tool compares the surface area of a few different satellite image products.

Multi-angle Options

Some satellite sensors can be pointed over a particular target area to acquire images. This has a few benefits. One is that a user can request that a particular feature be targeted thereby removing the problem of having to stitch adjacent images together since your study area can be placed in the middle of the image. Another advantage of pointable sensors is that they can be used to acquire stereo imagery which can be viewed in 3-D and can be used to create

Digital Elevation Models (DEMs). Other sensors that are not pointable (they always point straight down) usually use a systematic, predefined acquisition program that always acquires imagery over the same area. An example of this is the Landsat World Reference System (WRS) index that breaks up the globe into overlapping "tiles." These tiles each have unique reference numbers known as the "path" and "row." Knowing the path and row numbers makes it easy to search for all of the images available for your area of interest.

Repeat Interval

The repeat interval is the minimum time a particular feature can be recorded twice. For example, with Landsat the same image area can be recorded every 16 days. Some sensors with a very wide field of view can acquire multiple images of the same area in the same day. Another advantage of pointable sensors is that they can reduce the repeat time for which a feature can be recorded because they are not limited to viewing directly under the satellite.

It should also be noted that most remote sensing satellites have a near-polar orbit and are not able to acquire imagery at the poles since their orbit does not go over these areas.

Scheduling Options and Price

In many cases you can find appropriate imagery in an archive. However, if it is necessary to request new imagery for a particular area it is important to know what scheduling options exist and their associated costs. Most of the commercial providers have multiple scheduling options depending on the priority. High priority scheduling can cost several thousand dollars per image in addition to the image costs. Always check with the vendor to find out how their scheduling works and how much it costs.

Selecting Imagery over your area of Interest

Each of the image vendors and most of the image archives have some sort of browse facility that allows you to select the area you are interested in with links to browse images that show you what the image looks like before you purchase it. Some of the browse facilities use an interactive map that you can use to zoom in on and outline your area. Others let you specify the area using latitude and longitude coordinates. Many of the sites give you both map and coordinate options. Much effort has gone into improving the user interface for these sites and these days they are generally pretty straight forward to use with many providing short tutorials on how to use the browse facility.