

GEO/EVS 425/525 Unit 13

Obtaining Remotely Sensing Imagery

Remote sensing is a field that has grown incredibly in the last few years. As recently as 20 years ago, only one general-purpose satellite was functioning, and that carried only coarse panchromatic and multispectral sensors. Now there is almost an embarrassment of riches to choose among, and different satellites carry sensors of widely differing characteristics. In this exercise, you will search out and find at least three different satellite images of "interesting" places from at least three different satellites, and you will download one entire Thematic Mapper image. You should also think about the relative advantages and disadvantages of each satellite. Most of you should choose the Cuyahoga River watershed between Cleveland and Akron, although you are free to choose any area in (or near) Ohio.

The satellite systems from which you will choose are on the "links to neat places" page of the old department web page (<http://www.bqes.csuohio.edu/links.html>). You should definitely plan to include one Landsat-7 image, one SPOT image, and at least one of the images obtained from SpacelImaging (i.e. either an IRS/LISS image or an Ikonos image). You will download an image from the OhioView web site; this will be a Landsat-7 image.

For all of these sites, you should look at the prices charged for each image. You will notice that the sites can provide imagery in several forms. The basic unit is the scene. Some sites offer subscenes; others do not. Also, you can get data raw, partially massaged, or massaged more completely. You should ask yourself what level of massaging you would find most useful, and what forms of the data are most cost-effective.

The search sections of all of these systems has on-line documentation and usually a tutorial as well. However, they are all so idiosyncratic that they border on the useless. Hence rough instructions on the use of each system are given in this handout. If they are sufficiently detailed, you should be able to get information fairly easily. Otherwise, you should consult the "help" files available on the WorldWide Web.

USGS Sites

The USGS has two main data gateways for satellite imagery. They are the EarthExplorer site and the EOS Data Gateway site. Both do approximately the same things.

Go first to the EarthExplorer site (<http://earthexplorer.usgs.gov>). Note that you will need to use Internet Explorer or Netscape 4 for this site; Netscape 6 will not work. Assuming that you do not have an account on EarthExplorer, click on "guest" to log in as a guest. You will need to provide some information to the site in order to find imagery.

First, you have to indicate a location. The easiest way to do this is to click on "enter coordinates" and indicate the imagery you want by latitude/longitude. As a reference, Cleveland State University is roughly 41° 30' N, 81° 40' W. You can indicate either a point (i.e. a single latitude-longitude pair) or a rectangle (i.e. two latitude-longitude pairs, indicating diagonal corners of the rectangle) as your location. *The search engine will look for all images containing any part of the area you have indicated.*

Next, you have to indicate a data set. You have several data sets to choose from. Concentrate on satellite imagery. You should definitely choose Landsat-7 (also known as Enhanced Thematic Mapper Plus, or ETM+), and you can include any other imagery you wish. Feel free to choose anything that sounds interesting. You aren't paying for the imagery (yet)! Indicate your choices by clicking on the square to the left of the name.

When you have chosen your location and data set, click on "continue." You can now specify several other limitations on your search. You may want to limit the dates to be searched (but you do not need to,

especially if you are searching only for Landsat-7 data, since it will not search for data that do not exist),

and you will certainly wish to limit cloud cover (for general use, you should limit imagery to less than 10% cloud cover). You will probably also wish to specify more than 10 images to be reported (50 is a good number). You can leave all of the other fields at their default settings. When you have completed your search criteria, click on "search." The search engine will go through the USGS data base and report the number of images meeting your search criteria.

To see what you've gotten, click on the name of the data set. You will get images reported in groups of 10. Look at the information reported at this point. To see the browse image, click on the "show" column for the image that you're most interested in. Pick one of the browse images. If it shows the detail of the area you want, make sure that it is not already in our collection on the R drive. You will be downloading this image later from the OhioView site. Record the file name (i.e. path, row, and date), and print the browse image.

The other USGS site is the USGS EOS Data Gateway (<http://edcimswww.cr.usgs.gov/pub/imswelcome>). Enter the data center as a guest by clicking on Enter As Guest. The search procedure is a 4-step process.

You must first Select Search Keywords. You should use Method 2. Click on "sensor", then "select." You don't need to use a filter, but if you want to, choose "visible sensors." Choose your sensor. Landsat-7 is listed as Landsat ETM+. Note that this site has a great many more satellite images than the EarthExplorer site. Choose your sensor and hit OK.

The second step is to choose your area. Here you indicate an area you wish to search for, again by latitude-longitude. Note that this site does not have a field for North or South Latitude or East or West Longitude. South latitudes and West longitudes are indicated with a minus sign. You probably don't have to worry about South latitude, but most of you will need to look for West longitude.

The next step is to indicate the date range. The issues here are as they were with the EarthExplorer site. The default (standard date range) will probably suffice for your search. Finally, you need to indicate the other options you wish to consider. The basic options are given. You might want to look at the "all options" page to see what options exist beyond the basic, but you probably won't want to use them, Note that you can't specify a maximum cloud cover figure. You will have to get this information from the information reported back to you.

The actual search and the information reported back to you are essentially the same as with EarthExplorer. The instructions given above work here too.

For either of your USGS searches, you should print out the browse image for the scene you have chosen. **This printout should be included in your portfolio for this unit.**

SPOT

Next, go to the SPOT web site (www.spot.com). To get to the online catalog, click on "Products and Services", then "SPOT Imagery", then "Sirius Catalogue." Click on the Sirius Catalogue icon to enter the catalog. Click on "Visit our Catalog" to enter the catalogue. You should use "csustudent" as your user name and "geo425" as your password. The catalog dialog should then come up. You have to do things in a very particular order, and the type is very small, so that it can be confusing. At the very least, it is very idiosyncratic (and very French).

Click on "Type of Product." You will notice that the default product type is SPOT Scene. This is what you want. Pick a search mode to find your image. Longitude-latitude of a circular area is probably the easiest. You need to insert the longitude and latitude of the *center* of your circle of interest, then the radius of search. The search engine will locate all images that include any part of this radius. Make sure you put the latitude in the latitude field and the longitude in the longitude field! Then click on "Validate Criteria" at the bottom of the form. When the area has been validated, the point will appear in small red letters at the top of the main window. When the criteria have been validated, the note that you are looking for a SPOT scene will appear in very small red letters at the top of the main window.

Now click on the "Start Search" button at the top of the main window. Fairly quickly, you will see the results of your search. Click on the *number* of one of the images presented you. The image will appear, along with the image's metadata. Again, as with the Landsat7 image, make a printout of the best of the images produced in your search, and write the date on the printout. **This printout should be included in your portfolio for this unit.**

Spacelmaging

USGS and SPOT are governmental entities, although SPOT charges commercial rates for their imagery. Spacelmaging is a private corporation serving a number of public and private satellites, including their own. As a result, you have your choice of several satellites at this site. Go to the Spacelmaging gateway (www.spaceimaging.com) using Internet Explorer and enter the "enhanced" site. Click on "Browse and Buy," then on "CARTERRA Online." Enter the site as a guest. You have gotten onto the catalogue when the Map Manager (showing a world map) appears.

Your first step is to create an area of interest (AOI). Click on AOI on the menu bar. Choose a way to specify an AOI. If you choose latitude-longitude, you need to specify a rectangle using the diagonal corners. Alternatively (and probably more easily), you can zoom to the area you're interested in and then specify the AOI from the map.

Click on the "Find Data" button on the button bar. Choose your resolution (note that this is how you choose your satellite). Make any changes on the basic data form you need. You can limit cloud cover by clicking on "additional criteria" and entering a value for acceptable cloud cover and then clicking on OK. When your search criteria are complete, click on "Search." The system will search for your data and return metadata for images that meet your criteria.

You can get the browse images for the images that look most promising (note the "cloud cover" column) by clicking on "preview." Again, choose the best of the IRS or Ikonos images and print it. **This printout should be included in your portfolio for this unit.**

OhioView

The OhioView consortium is one of the most remarkable educational enterprises going today. It started when a faculty member at Miami University pulled together colleagues from around Ohio to reduce the time and expense required to obtain Landsat-7 data from the USGS. CSU is a member of the consortium. As a result, we can obtain Landsat-7 data within a couple of days of a flyover, and we can obtain them free of charge.

You will download the image you found on the USGS EarthExplorer (or EOS gateway) site. Go to the OhioView web site (www.ohioview.org), and choose "data services," then "Browse Landsat." Choose the path and row of your image, then go to your image. You will note that the image appears in individual bands in TIFF format. Download each band (i.e. bands 1-5, 7-8, and one or the other band 6). You can download all 8 bands simultaneously (with luck; this works best when internet traffic is low, as at night or on weekends). Again, be sure that this image isn't already on the R drive.

Questions to Consider

1. Of all of the series of satellite images you have looked at in this exercise, what are the advantages and disadvantages of each?
2. Of the various satellite images you have looked at in this exercise, which appears to be the richest in information? In access? In cost-effectiveness?
3. For each of the satellite images you have looked at in this exercise, what level of massaging do you believe would be most appropriate for the sorts of work you would be most likely to do?

Portfolio

1. Your printout of the best Landsat-7 image.
2. Your printout of the best SPOT image.
3. Your printout of the best IRS or Ikonos image.