Remote Sensing

Preparation

A good overview of remote sensing can be found at the online sites listed below. These sites will prepare you with some background that might be useful for this exercise. Beware, however, that these sites go into much more detail than is needed for this exercise.

Background

‘Remote sensing’ is the science (and to some extent, art) of acquiring information about the Earth’s surface without actually being in contact with it. We do this by sensing and recording reflected or emitted energy and processing, analyzing, and applying that information.

Most Important Concepts To Remember:

The visible (red, green, blue) spectrum. On this true-color image, features will appear as if you would normally see them - healthy vegetation is green, deep water is black, shallow water is blue to green, buildings are white to shades of grey.

The infrared spectrum. Substituting the near infrared band for the red band. An interesting difference between these two wavelengths is that healthy vegetation reflects near infrared light (e.g., so more red appears in areas with healthy vegetation). Thus, healthy vegetation is red, deep water is black, shallow water is blue to green, buildings are white to shades of grey.

Resources

NASA has a very good and comprehensive overview of remote sensing, including concepts, history, and applications at http://rst.gsfc.nasa.gov/start.html

NASA’s Visible Earth web page provides a searchable inventory of some of the more impressive remote sensing images that NASA has collected. It is searchable by location, theme, and sensor. This web site is located at the URL: http://visibleearth.nasa.gov/

The Canadian Centre for Remote Sensing has a good overview of remote sensing, available at the URL: http://www.ccrs.nrcan.gc.ca/ccrs/learn/tutorials/fundam/chapter1/chapter1_1_e.html
Step 1.

Look at the color image provided below. This image is from the Landsat satellite. Landsat has been a mainstay observational satellite since the 1970’s. The sensors include data from the visible (red, green, blue) through thermal parts of the spectrum. Pixels are $\sim 30m^2$. On this true-color image, features appear as if you were in the satellite looking down - healthy vegetation is green, deep water is black, shallow water is blue to green, buildings are white to shades of grey.

Look at specific features that should be recognizable to you – the Everglades, downtown Miami, Biscayne Bay, Miami Beach, and so on. Realize that this image covers a large area – think of how long it would take you to drive from your house to the Everglades, for example, yet you can see the whole area on this one image.

If you are having trouble orienting yourself to this map – look to the right side of the photograph – note the white line on the edge of the land, This is the beach area along the coast of South Florida. If you follow the white beaches down to the end, you will see that the land has broken away the mainland - this is Miami Beach. As you continue down to South Beach and look directly west, you will see a white polygon area – this is the Port of Miami. Underneath the Port of Miami / Miami Beach area is the island of Virginia Key, and beneath Virginia Key is the bigger island of Key Biscayne. Note that Miami Beach, Virginia Key, and Key Biscayne are bounded to the east by the open Atlantic, to the west by Biscayne Bay.
Step 2.

This image is also from the Landsat satellite, but uses different band combinations to highlight different information. On this image, the only change we made was to substitute the near infrared band for the red band. An interesting difference between these two wavelengths is that healthy vegetation reflects near infrared light (e.g., so more red appears in areas with healthy vegetation), whereas it absorbs red light. Thus, healthy vegetation is red, deep water is black, shallow water is blue to green, buildings are white to shades of grey.

On this image, note the areas where you see lots of red. What do you think the red is in the various locations? A few areas to focus on could be:

1. The Everglades. Note the tear-shaped features – these are the tree islands.
2. Southwest Miami. Look at the shapes of the plots, and note that they are square. These are fields of crops.
3. Miami Beach. Note the green on the west side of the island – these are golf courses.
4. Virginia Key. Can you pick out the sewage treatment plant? (The little white square at the top of the island).