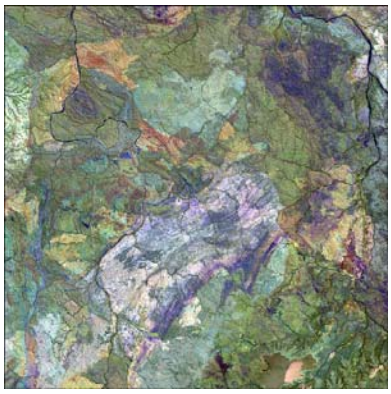
Exercise #2

Reflectance Spectra



Objectives

- **To examine the spectral reflectance curves of some common land cover.**
- **To use the internet to locate and examine spectra.**

1. The figure below shows the reflectance spectrum for a common land cover.

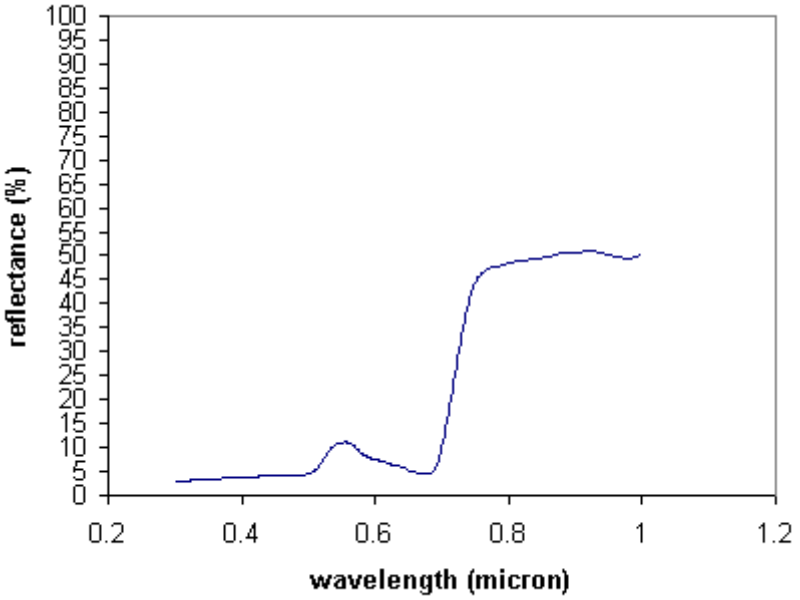
   (a) What primary color does the peak in the visible portion of the spectrum correspond to?

   (b) Which of the following is this spectrum most likely to belong to? Why?

   1. soil; 2. snow; 3. water; 4. concrete; 5. grass; 6. rock

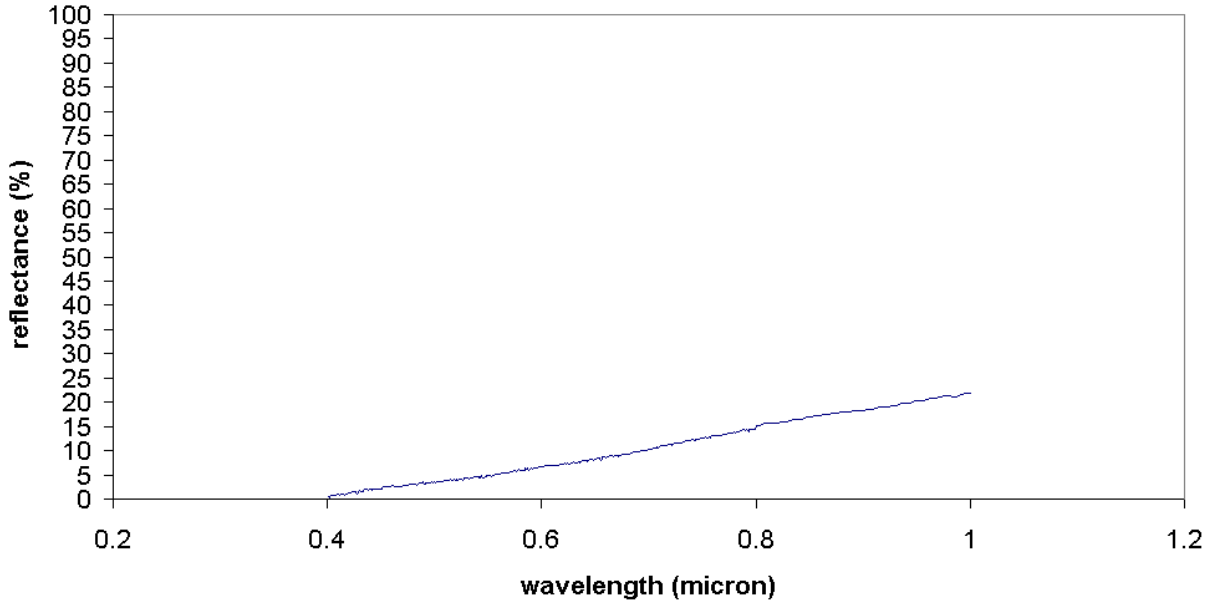
   (c) In which of the Landsat 7 bands would the recorded brightness most likely be highest?

   (d) In which of the Landsat 7 <u>visible</u> bands would the recorded brightness most likely be highest?

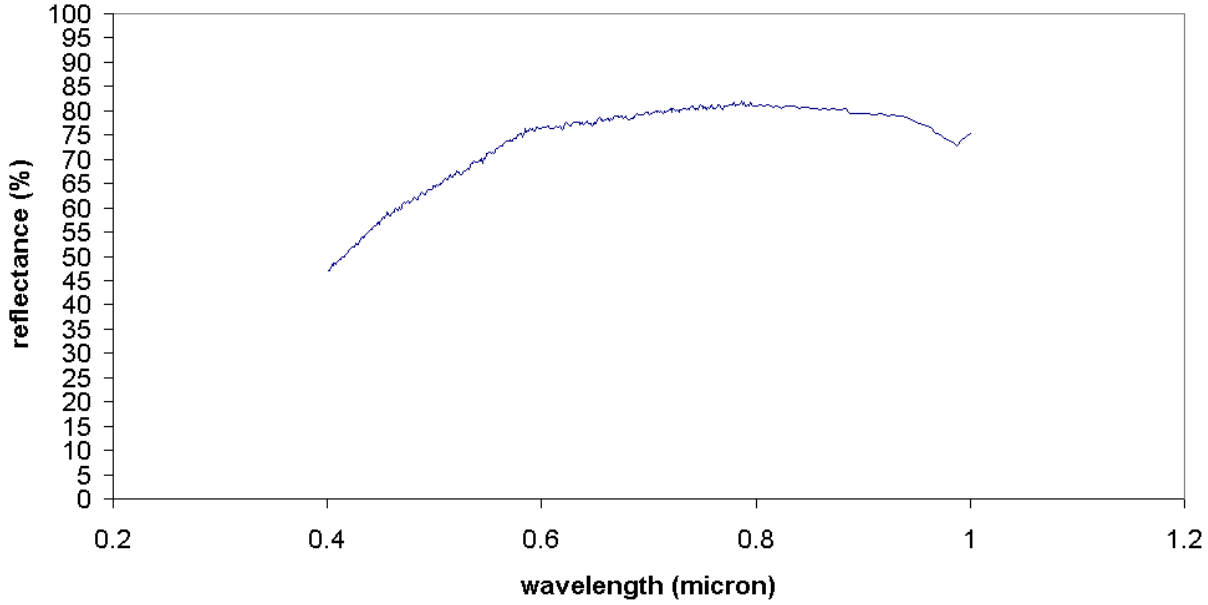


The three figures below show spectra from 3 different soils – **black loam, dark brown interior moist clay loam, and white gypsum dune sand.**

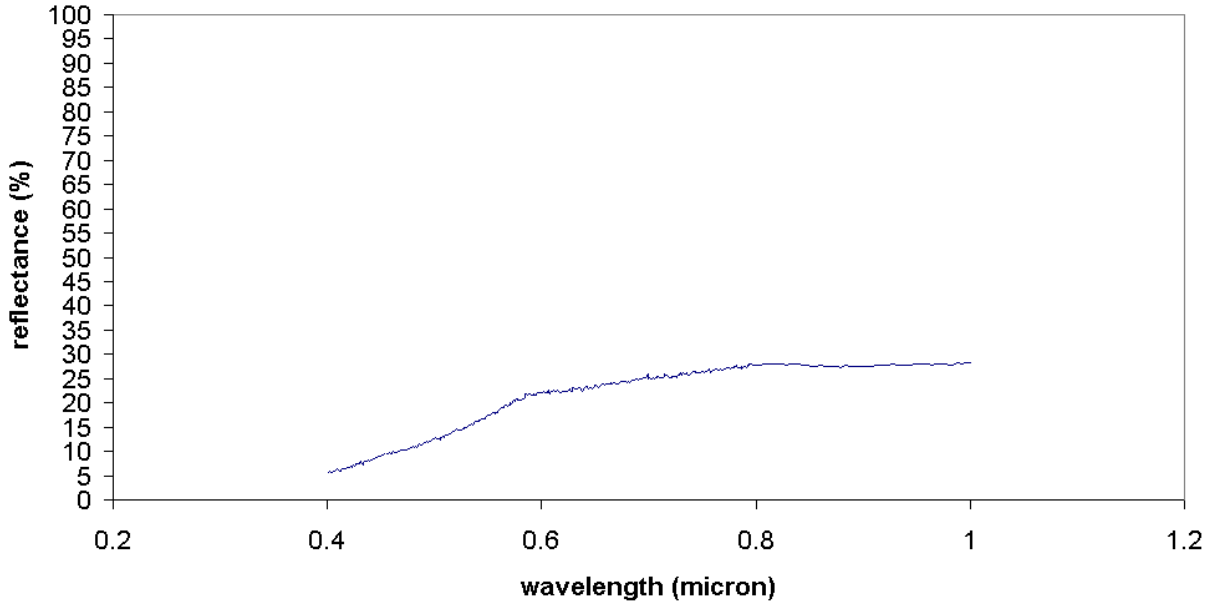
A.



B.



C.



2. **(a) Which soil, A, B or C, is brightest in the visible?**

(b) Which soil, A, B or C, is darkest in the visible?

(c) Match the soils, A, B and C, to the types of soil listed above and explain your reasoning.

Spectra like these have been measured for remote sensing applications. You can find some on NASA's JPL (Jet Propulsion Lab.) ASTER web site.
3. In this exercise you will plot and examine the spectra of snow, ice and water from this site.

(a) Go to the ASTER Web Site (http://asterweb.jpl.nasa.gov/) and scroll to the bottom of the page. Select Spectral Library. You will see an example spectrum and some options on the left of the screen. Select SEARCH. Then select Water/Snow/Ice. Leave the options as they stand and select RUN QUERY. Print out (and turn in) the graphs for:

Coarse granular snow
Tap Water
Ice

Note that the reflectance spectra are plotted from 0 to 15 microns. Why does this not give us a particularly good idea of the visible appearance of these?

(b) In order to compare the brightness and color of these it is useful to plot them on the same graph. You can do this by going back to each of the web pages and downloading the actual plot data to a text file. (Right click on View/Save Data File and choose option to Save Target As.) Then open your text file in Excel and save it as a spreadsheet. Do this for each of the land covers. Then combine the spreadsheets into a single one so that you can plot the data together on a single graph. (I have done this for you. The Excel file containing three sheets of data – one for snow, one for water and one for ice is available by clicking here – snowicewater_data.xls) Plot two graphs. Each should show a comparison of the spectral reflectances for snow, ice and water by plotting three curves on the same graph, using a different color or line pattern for each. The first graph should show the full spectral range of the data; the second should show just the visible portion of the spectral range. Turn in your graphs.

(c) Why might you have difficulty distinguishing ice from water?

(d) What is "albedo"? (Find out!) What do you think is the value (approximately) of the albedo of snow?

(e) As global warming occurs and the snow at the poles starts to melt, what will happen to the Earth's albedo? Why will this further enhance the warming?

Last Modified: 12 Jan 2007 by Helen Cox