Name: _____

Remote Sensing of the Environment
GEOG/GEOL 4093/5093
Spring Semester 2008

Lab Exercise #5: 10/02/2008
Due: 10/09/2008

Part I: Concepts: Landsat Satellites

Regarding the Landsat satellites:

(1) What does the acronym TM stand for and when was it first used? (3)

(2) What are the different IFOV's for the different sensors MSS, TM, ETM (size of pixel)? (6)

(3) What are the orbit times, altitude, equator crossing times of the Landsat satellites? (2)

(4) Describe and discuss the difference between environmental (polar orbiting) and meteorological (geostationary) satellites? (5) (You may need another sheet of paper).

Part 2: Assessing Volcanic Eruption Damage

Launch Internet Explorer and type *\\nyx\rs4093* into address bar and hit enter, that takes you to the remote sensing class folder "*rs4093*" in CIRES server. Copy the folder "*Lab_5*" to "*C:"* drive.

Run ENVI and **open** the following files from the "*C:*" drive/lab_5 on your machine: May83ch1, May83ch2, May83ch3, May83ch4. If these files have already been opened by ENVI on your machine, a header file will be found in the data directory that ENVI will use to open the files. Otherwise, if this is the first time the files have been opened by ENVI, you must open the files one at a time and ENVI will prompt you for the header information. Fill in the empty edit boxes with the following information then hit OK: Samples = 3548, Lines=2983, Bands=1, Offset=0.

When all four files (channels) have been loaded into the available bands window, select the RGB radio button to load a color image and select R: channel 4, G: channel 2, B: channel 1. You will now be looking at a LANDSAT image of the Mt. St. Helens area from 1983. In May of 1980, Mt. St. Helens erupted and transformed the surrounding landscape. Check out the following URL maintained by USGS for additional information on this eruption:

http://vulcan.wr.usgs.gov/Volcanoes/MSH/framework.html

(5) During what geological time was the last significant dormant period (~6000 years) of Mt. St. Helens? In the last 525 years, it is known to have produced **how many** major explosive eruptions (each with at least 1 cubic kilometer of eruption deposits) (4)?

We will use this image to approximate lengths and areas from pixels counts.

(6) From the *Tools* menu in the *Image* window select *Tools->Profiles->Arbitrary Profile*. This action will bring up a dialog named *#1Spatial Profile Tool*. If it is not selected, select the *Image* radio button. You may minimize this dialog or leave it on top. In the *Image* window, locate the cross-hair cursor over the rim of the volcano crater and click the left mouse button. Now move the cross-hair cursor to the opposite edge of the rim and click the left mouse button again followed by the right mouse button. This should produce a line across the crater roughly the length of the crater diameter. There should also be a small square highlighted on this line. Move the cross-hair cursor to this small square and click the right mouse button again. A *Spatial Profile* chart will pop up with information about the arbitrary profile that you just created across your image. On the y-axis, the *Data Value* of each pixel (the relative brightness) is listed and on the x-axis the *Location* or relative pixel number is listed. The pixel length of the line you just created across the crater diameter is the same as the number of pixels listed on the *Location* axis. If each pixel is 82 m x 82 m, what is the approximate diameter of the crater from this exercise (give in units of kilometers)? Is there an easier way of determining this diameter (5)?

(7) Close all of the *Spatial Profile* windows that you used to estimate the crater diameter. This is an **important step**, as the next set of windows will not respond properly without them closed. From the main ENVI menu select *Basic Tools- or from Main Display Window->Region of Interest*. This action will bring up the *Region of Interest* dialog. Define and trace the area that has been damaged by lava from the lateral blast. This area is distinct from the surrounding vegetation. Record this area in square kilometers of mountainside damaged. Determine the extent (length) of this damage from the crater in kilometers. How does your "mountainside damaged" value compare to the "area covered by the lateral blast" value as described in the USGS eruption summary table (some unite conversion may be necessary)? (5)