ANTH 583 – GIS and Imagery Analysis
Project 2
Due: March 11th

This project is designed for you to demonstrate:
1) Terrain analysis
2) Least-cost analysis
3) Querying raster data with vector points
4) Building on previous vector analysis and querying skills

Background
Download the "project_2.zip" file from Blackboard, and unzip it onto your hard-drive. This will create a new folder called "Project_2," which contains to spreadsheet files (with ".csv" file extentions) and one GRASS location folder called "Hasa_wgs84_UTMz36n." You must copy the GRASS location folder to your GRASS_Data directory with all your other GRASS locations (as we discussed several weeks back). The ".csv" spreadsheet files contain explanations for the codes used in the data tables associated with the vector site data in the GRASS location, so you will need these to interpret the tables.
The GRASS location contains an SRTM DEM at 30m resolution for the Wadi Hasa region in central Jordan. It also contains two site databases for the Wadi Hasa Survey ("WHS_sites") and the Wadi Hasa North Bank Survey ("WHNBS_sites"). These are real data collected over many years and used in several publications. You will use them to complete the following tasks

Part 1: Conduct a basic terrain analysis of the Wadi Hasa region
1) Use r.slope.aspect to create maps of slope and aspect, use r.watershed to create a map of flow accumulation, and use r.param.scale to create a map of landscape features.
2) Using the v.what.rast tool, upload values for slope, aspect, and flow accumulation into the tables for each set of sites.
3) Use v.stream to extract a stream network from your flow accumulation map. Tune the module to only extract large streams.
4) Create a hillshade map, and create an output graphic with the slope map you made draped over the hillshade. Include the streams and site points and the basic map elements (North Arrow, Scalebar, and Legend). Be sure to style your vectors before you save out the graphic. Create a second such map, but this time drape the landscape feature map instead of the slope map.

Part 2: Conduct a least cost analysis for a series of sites from the survey databases
1) Use a series of SQL queries with v.db.select to extract a small subset of similar sites from one of the larger sets of survey points. Your query should include site type AND *at least* one other characteristic from your terrain analysis above (slope, aspect, flow accumulation, or landscape feature). You should be trying to obtain a set of less than one hundred sites.
2) Use v.to.points to extract a series of points along the streams you created earlier. Use these points as the starting points for a least-cost surface calculation using the r.walk tool. Adjust the colors of the resulting cost-surface map with r.colors.
3) Use v.what.rast to upload the walking times into the table of your extracted set of points. Use v.univar to calculate the mean walking time from your set of sites to the nearest stream (walking time will be in seconds. Convert this to hours in your writeup).

4) Use v.distance to upload the shortest straight line distance from your points to the nearest stream. Use v.univar to calculate the mean distance, then convert this to the time it would take to walk this distance in hours using the average human walking speed of 5 kilometers per hour.
4) Produce a 3-D perspective graphic (NOT a hillshade) showing the cost-surface draped over the elevation, with the streams and the sites overlain as well.

Part 4: Writeup

Prepare a brief report (1-2 pages) about your analysis. This should be roughly divided into three sections.

In the first part, refer to your two hillshade maps, and describe the basic pattern of landforms and landscape features in the Wadi Hasa region, including the streams you extracted. Discuss how these natural features seem to be influencing the spatial patterning of the archaeological sites (based on a qualitative visual analysis). Be sure to discuss any analytical choices you may have made that might influence your analysis (color schemes, vertical exaggeration, stream thresholds etc.)

In the second part, discuss the process by which you extracted the subset of sites. Why did you choose to make the queries you did? Is the final set of sites archaeologically meaningful? Discuss the outcome of your least-cost analysis. Were your sites generally close to streams? How did the walking times derived from r.walk differ from those you calculated with v.distance? Which analysis do you think gives the most realistic results?

In the third and final part, reflect on the technical procedures you conducted above. How might error propagate through the analysis, and how might that affect the outcome? What other types of analyses would you have liked to do to extend what you did here?

You will turn the writeup in in digital format through TurnItIn on Blackboard. You should include your output graphics as a figures embedded in the writeup.