**Geographic Information Science Exercise 11 (Questions)**

**Raster Analysis**

These questions will require you to use the skills and information you learned in Tutorial 12 and the reading in Chapter 11. They involve working with raster data, which allows for many different types of analysis compared to vector data.

To answer the questions you will need to use the data in the following folders:

**mgisdata\BlackHills\**

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**Note:** For all raster outputs to questions, cells that are not of interest should have a value of 0 and be colored gray 10%.

**Step 1:** Create your own file geodatabase to store all of your output for the questions below. Name your geodatabase *Exercise11.*

**Step 2:** Set the Geoprocessing Environments to:

Workspace = *Exercise11* geodatabase

Cell size = 30m

Masks = off

**Question 1:** Create a Boolean raster showing areas where the density of vegetation is open (DENSITY96 is 0 or A) and the land is owned by the forest service (OWNER is NFS). **Capture** the map and Table of Contents (insert here). (**Remember:** in a raster, the areas of interest should have a value of 1 and the areas not of interest should have a value of 0. Color your 0 values gray 10%).

**Question 2:** Create a Boolean raster showing the areas that are within 1000 meters of a primary or secondary road (TYPE = P or S). **Capture** your map and table of contents (insert here).

**Question 3:** Use Block statistics on the *slope30m* raster (created in the tutorial) to calculate average slopes over 300 x 300 meter areas. Then create a Boolean raster showing where the average slopes are <10 degrees. **Capture** your map and Table of Contents (insert here).

**Question 4:** Imagine that you are looking for a good landfill site. Use the rasters produced in Questions 1-3 (above) to create a Boolean raster showing the areas where all three conditions are met. What is the total area of these potential sites? **Capture** your map and Table of Contents (insert here).

**Question 5:** The site must be at least 1 sq. km in area to be considered for the landfill. **Create** a helpful map (with Title, Legend, etc.) of the sites meeting this criterion, labeled with the site area in square kilometers and including helpful information, such as streams and roads, for the final selection. Save map as a **PDF**. How many potential sites meet the minimum area criterion? (**HINT**: Convert the sites to polygons).

**Question 6:** Which geologic unit has the highest average slope? Which has the lowest? What is the average slope for each one? **Capture** the table (insert here)

**Question 7:** The *canopy* raster contains the forest canopy percentage. Create a map of *wshds2c* showing the average canopy percentage for each watershed. **Capture** your map and Table of Contents (insert here).

**Question 8:** Prime harvestable timber in the Black Hills has *SSTAGE96 = 4C or 5* and is more than 200 meters from a stream. How much good timber is available, in square kilometers? Create a map showing the timber and streams. **Capture** the map and Table of Contents (insert here).

**Question 9:** Which of the summits has the highest elevation? Which has the lowest? What are their elevations?

**Question 10:** Create a raster with an integer canopy index that ranges from 1 to 5. Create another raster with an integer slope index that ranges from 1 to 5. From these, produce a raster showing an erosion potential index based on canopy and slope (**Hint:** Use Reclassify). **Create** a helpful map (with Title, Legend, etc.) showing erosion potential. Include helpful information such as roads. Save map as a **PDF.**

**Deliverables:**

* This answer sheet with screen captures for the following questions
  + Question 1
  + Question 2
  + Question 3
  + Question 4
  + Question 6
  + Question 7
  + Question 8
* PDFs of the following maps:
  + Question 5
  + Question 10