Lab 10: Raster Analyses

***What You'll Learn*:** Spatial analysis and modeling with raster data. You will estimae the access costs for all points on a landscape, based on slope and distance to roads. You'll then apply a threshold to this access cost.

You should read chapter 10 in the GIS Fundamentals textbook before performing this lesson.

Data are located in the L10\ subdirectory, including *mar_rd83.shp*, a vector road layer, in NAD83 UTM zone 15 coordinates, meters, and *mardem*, a raster elevation grid, NAD83 UTM zone 15 coordinates, 30m cell size, Z units in meters

What You'll Produce: A map of a cost surface with an applied threshold.

Background

Raster analysis is commonly applied when working with continuous data, e.g. elevation, slope, or distance from features of interest. In this exercise we will calculate an access cost surface based on raster and vector data layers. This is a highly simplified example, but introduces basic tools are useful in a range of problems.

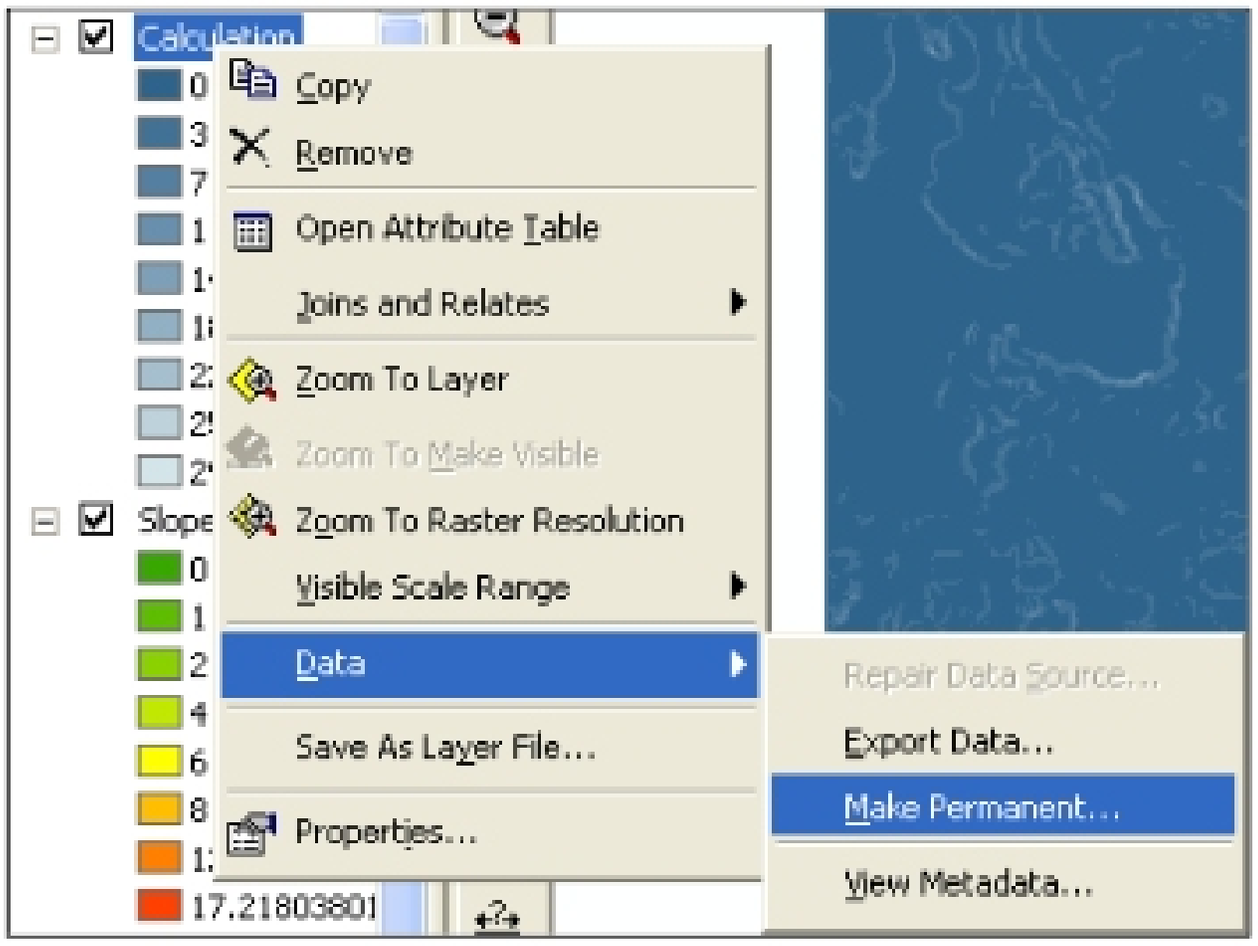
Our cost surface will depend on slope and distance to existing roads. In our problem, we will assign a road construction cost of $25 per meter of road required. We have a vector data layer of roads, digitized from USGS maps, and we will use grid functions to convert this to a cost data layer.

Slope also affects access costs, because roads on steeper terrain are more expensive. The cost is nonlinear, increasing slowly at first for low slopes, then more rapidly at steeper slopes. We will derive slope from a DEM data layer. We will modify the tables associated with both the derived slope and distance layers to include a cost column. To reflect the nonlinearity in slope costs, we will apply the trigonometric sine function to model this increase in cost. We will then add these two cost layers. Finally, we wish to apply an upper threshold of $5,000 to consider only those areas that are within our budget.

You should note that most layers that are output from ArcMap raster functions are temporary. If you wish to save them, you must explicitly make them permanent. Temporary files are available as long as the session is running. However, if you have not saved them, and you close an ArcMap project, you will likely lose your temporary files.

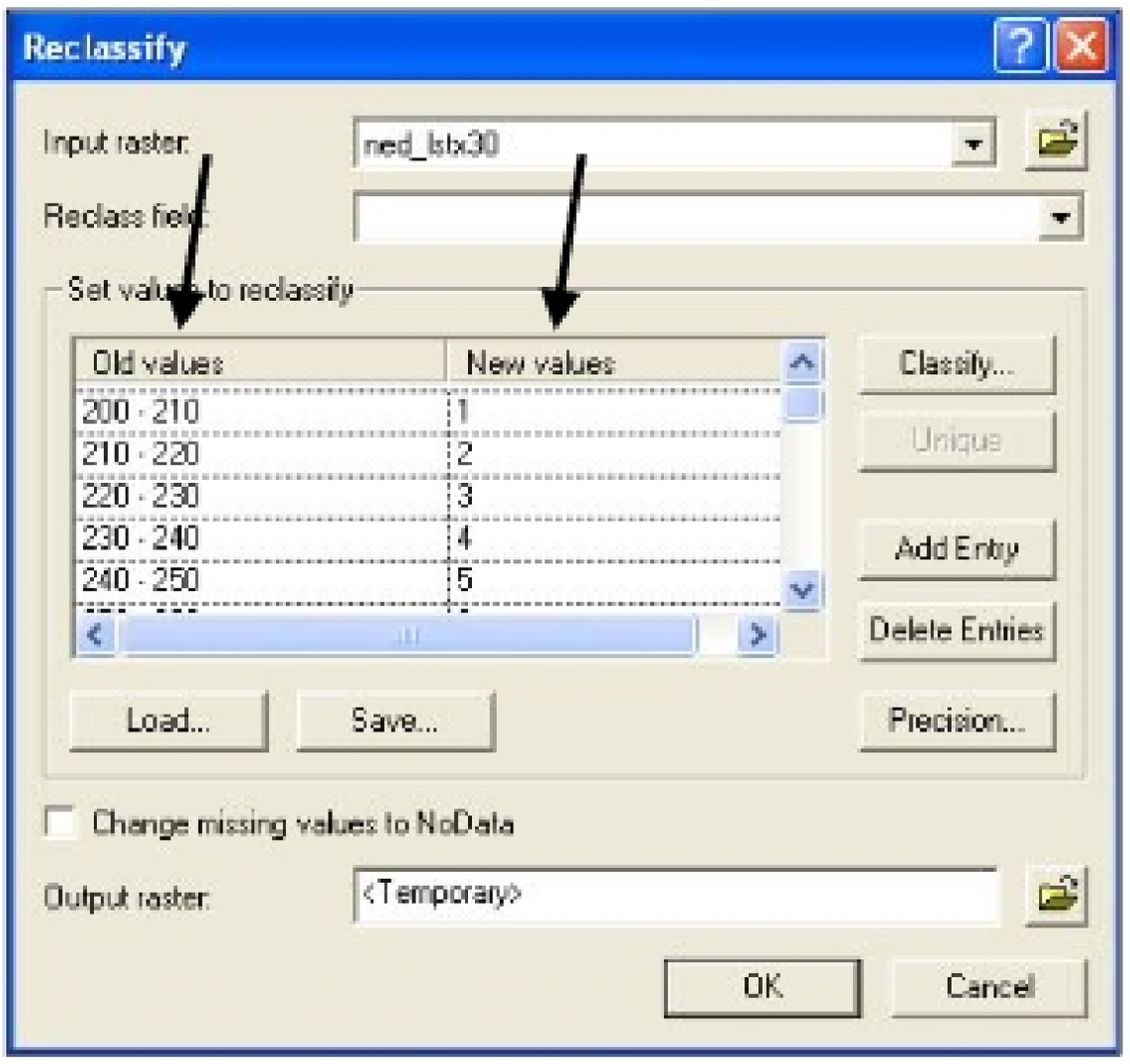
Much of the work in this lesson has been covered in previous lessons.

Make temporary raster layers permanent by right clicking on the name in the Table of Contents (TOC), then left clicking on the **Data -> Make Permanent** choice in the dropdown menu.



Before we start, we need to describe a difference between a permanent reclassification you'll be doing today, and a display reclass you've done before and you'll also do today.

Remember, a reclassification is a conversion from one set of numbers to another. We do this in a raster GIS through a reclass table. This table has a column for input values (Old values in the figure at right) and a column for output values (New values in the figure at right). Each cell value is examined, and input value matched to an entry in the table, and the corresponding output value reassigned according to the table. For example, the table at right specifies that all Old values between 210 and 220 are assigned a new value of 2.



In a permanent reclassification, each output value is saved to a new raster. In a display reclassification, the value is used only to assign symbols for display. No data are changed in the source file, nor are new files saved. In previous lessons we have only performed reclassifications for display. Today we will perform a permanent reclassification. It is easy to get confused, because the classify menus for applying these classifications are similar.

Start ArcGIS - ArcMAP

- Create a new map project, add the raster ***mardem*** to the view, and inspect it.

Use the cursor and the layer **Properties –Source** tab. What are the units of the elevation? What are the highest and lowest elevation values? Does it make sense?

- Derive the slope for *mardem*. Select **Spatial Analyst – Surface Analysis – Slope**. Specify degrees units for slope. Name the output file *mar_slope*.

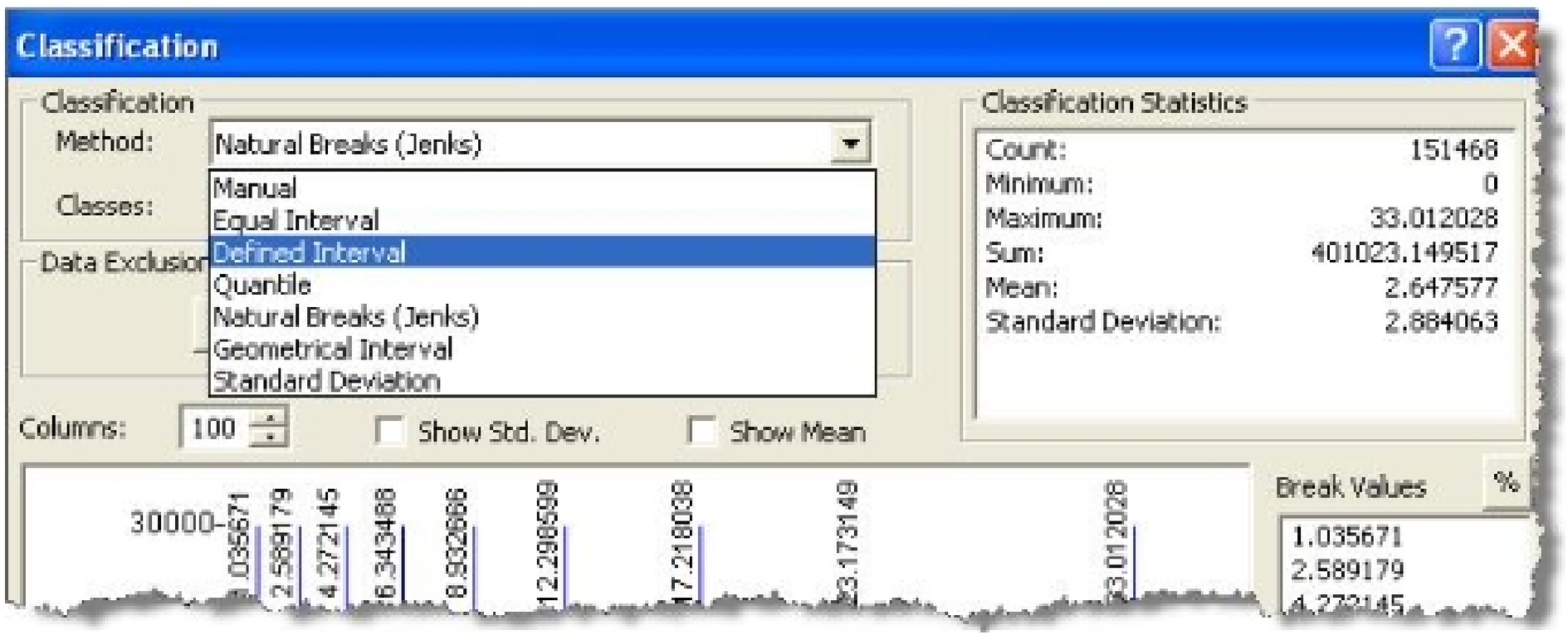
- To keep the view uncluttered, remove the *mardem* grid from the map.

- Examine the slope layer. The should be values from 0 to about 33 degrees.

- Select Spatial Analyst – **Reclassify**. You'll get a popup menu, with a reclassification table, similar to the table in the figure on the previous page (***Video: L10_1_Reclass.mov***).

- At this popup menu click on the **Classify** button. This will open a classification window that is exactly equal to the window you see when changing the symbology for a layer. However, in this case you are using to change the assignment or classification table.

- Here, select a **Defined Interval** classification with an interval width of 1.



- Left click on OK