

Exercise 9 – Spatial Interpolation 30 points

Introduction

This exercise is designed to introduce you to spatial interpolation in ArcGIS. We will be interpolating loess thickness data that Prof. Scull collected several summers ago with a colleague in western Wisconsin. What is loess? Loess is extremely well-sorted silt deposits found down wind of large glacial river systems. Thus, they are eolian (wind deposited) in origin, but were ultimately derived from glacial outwash. As a result, loess thickness typically decreases with increasing distance from river floodplains. The project Prof. Scull previously worked on involved using geochemistry and particle size analysis to try to differentiate between different types of loess. Ultimately that research was geared toward trying to understand the spatial distribution of loess on the landscape, as it is unclear whether all of the loess blew out of the Mississippi or whether there were more local sources.

As an aside, if you're interested in the answer to this question you can read the paper that was published using these data. See: Scull, P. and Schaetzl, R. (2011) Using PCA to Characterize and Differentiate Loess Deposits in Wisconsin and Upper Michigan, USA. *Geomorphology*. 127: 143-155.

For our lab we will be looking at how loess thickness varies relative to the Mississippi River. In order to do this we will need to interpolate, and in some cases extrapolate, the data from the sample points to a surface. You will need to perform several interpolations to meet the objectives of the lab, which should illustrate some of the advantages and disadvantages of different interpolation methods.

PLEASE NOTE: To make sure you obtain the correct answers we recommend that you use 1000m grid cell resolution. This will result in a grid with cell areas of $1000 \times 1000 \text{m} = 1 \text{km}^2$. We also recommend that you use the Wisconsin shapefile as a mask.

Data

This exercise uses two different data layers that have been placed in the Lab09 archive. In addition to the data used for the tutorial, the archive contains the following data, which are georeferenced in UTM Zone 15N NAD 1983 coordinates:

1. A sample point shapefile (WI_Loess.shp). The sample includes 228 points and the field 'L_THICK' in the attribute table is the measured loess thickness in centimeters.
2. The Mississippi River (MissRiver.shp)
3. Wisconsin shapefile (wisc.shp)

Objective

Use both IDW and ordinary kriging to determine the area of Wisconsin that is blanketed by at least 100 cm of loess. In addition, determine the percentage of landscape within 50km of the Mississippi and within 50 -100km of the Mississippi that is blanketed with at least 100 cm of loess according to each method. Enter your answers in the table on the back of this exercise. Be aware that there are multiple ways in which you can approach this problem.

Please use the state of Wisconsin as your study area and produce a well-designed map that illustrates the results. Include on your map *****the table, including***** the percentages for each method and don't forget the other necessary map elements, such as scale, north arrow, etc.

Also include a flow chart of your process, in which you will indicate the number of points in your search radius.

Table: Area and percentage blanketed by at least 100cm of loess (km²)

		IDW		Kriging	
	Total Area	Area	%	Area	%
Wisconsin					
0 – 50 km					
50 – 100 km					