

Spatial interpolation and mapping

Homework #10

The assignment

Introduction

The North Dakota Department of Forestry is interested in the status of windbreaks across the state in response to recent commodity markets and agricultural policies. A GIS technician did a statewide survey on 195 randomly-placed plots—with at least a couple per county—in which they delineated windbreaks as they appeared in 2010 imagery and did the same for 2015, using the same plots. The technician extrapolated windbreak mileage and density from the sampled area to the entire state to estimate amount per year and change, but these are broad, state-wide numbers. They have contacted you to conduct a spatial analysis to address the following questions:

1. What is the spatial pattern of change in windbreak density between 2010 and 2015?
2. What parts of the state, geographically and by ecoregion, have the most windbreaks? Which have the least?
3. Which parts of the state, geographically and by ecoregion, showed the greatest change in windbreak density during the study region? Which showed the least?

Data loading and preparation

Another technician has already extracted the points from the GIS shapefile and converted it to an `.Rdata` object. In case you are curious, this is the code that was used:

```
library(rgdal)
wb.pts <- readOGR(dsn=path.expand("./WindbreakPoints"),
                 layer="Imagery Points")
proj4string(wb.pts) <- CRS("+proj=utm +zone=14
                          +ellps=GRS80 +towgs84=0,0,0,0,0,0,0
                          +units=m +no_defs")
wb.pts <- spTransform(wb.pts, CRS("+init=epsg:4326"))
windbreak.points <- as.data.frame(unlist(wb.pts@coords))
colnames(windbreak.points) <- c("long", "lat")
windbreak.points$id <- rownames(wb.pts@data)
```

The technician also exported the results of the windbreak sampling as windbreak density (miles of windbreak per 1.98 square mile plots) per year. These data have been made available to you as two `data.frames` called `windbreak.points` and `windbreak.densities` combined in an R `list` object called `windbreak.data`. It is available here: https://drive.google.com/open?id=0BxjBY1g0ye_TUU90aUxFRUZhYzg

Before you begin your analysis, you will need to

1. Extract the `data.frames` from the `list` object
2. merge the two `data.frames` into one by their common column, `id`.

Then you can proceed to use code from class to answer the three research questions above. Use R `markdown` to prepare a report for the North Dakota Department of Forestry. Answer the questions fully, providing graphical and/or table support as necessary. Remember that captions help make figures more interpretable. The Department does want to see your script, so add it to the end as an Appendix, but there should not be anything R-related in the main part of the document aside from figures.