Extracting Climate Statistics from Spatial Data - R Tutorial

**Goal:** Familiarize yourself with R Studio data by mapping geospatial and climate data. You will be working with WorldClim climate data (temperature and precipitation). You can read more about this dataset at <http://www.worldclim.org/>.

* Download and install R and R Studio (free)
  + <https://www.rstudio.com/products/rstudio/download/>
  + <https://rweb.crmda.ku.edu/cran/>
  + If you ANY questions about R there is a lot of information online. Feel free to email me as well.
* Getting the data

1. Create a folder in your C: drive called “Tutorial”.
2. Download the *climate\_tutorial.zip* file I sent in the email.
3. Save *climate\_tutorial.zip* to the *Tutorial* folder and unzip the contents.
4. Files include: Ecoregion shapefiles (ecoregion), Monthly precipitation rasters (prec\_19), mean monthly temperature rasters (tmean\_10m\_bil), and the *ClimateTutorial* R file.
5. Make sure that the filepath to the data is C:/Tutorial/climate\_tutorial or the code with not work. Email me if you have trouble here.

* Run R Studio, choose open file, and select the *ClimateTutorial.R* file in the *climate\_tutorial* folder
  + Now you should see all the code needed to explore the data. I have tried to make it so you can go line-by-line through the code and see the plot results in the “plot” window, or numerical outputs in the “console” window.
  + To run a line of code in R place your cursor on a line of code and press *Ctrl+R* on your keyboard. You can also highlight the line of code and press the *Run* button.
  + Not every line will show you anything, but you should see the code run in the *console* window. This is to get you familiar with what R is doing.
* Pay special attention to the comments (# Comment) in R to guide you through the steps!
* To get started you will need to install packages that will be used for visualization and analysis. These packages contain the “background code” that retrieves data and do the calculations.
  + First you need to run > install.packages(“Name of package”) for every package.
  + Then run > library(Name of package) for every package.
  + The libraries are already at the top of the script I sent you. However, you will need to install the packages on your own.
  + Then set the working directory to where you saved the *climate\_tutorial* folder

> setwd(“D:/Climate/climate\_tutorial/”)

* Now work in the R file. The comments should guide you through all the steps.

**Future Goals:** If you are interested…

* Compare current, present and past annual time series by ecoregion.

With WorldClim we can look at past data, present data, and future predictions by ecoregion to see which ecoregion is projected to have the highest rate of change.

**Issues**: WorldClim is interpolated and averaged for a ~30 year time period, but is only given as monthly raster grids. We need MODIS (or other remote sensing platform) to do a multiyear time series analysis.

**Helpful Links:**

* <http://creativemorphometrics.co.vu/blog/2014/03/27/extracting-climate-data-in-r/>
* <https://gis.stackexchange.com/questions/227585/how-to-use-r-to-extract-data-from-worldclim>
* <https://ecologicaconciencia.wordpress.com/2013/11/29/obtaining-macroclimate-data-with-r-to-model-species-distributions/>