

General Analysis of Waypoints

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1 June 2015

OVERVIEW

This is an R Markdown document that allows formatted text, R code, and data to coexist in a single document...and in a way that can be ‘knitted’ together as an attractively formatted .pdf file. Here, we will pull in some waypoint data from the Peloncillo Project May 2015 trip, and run through a few analyses. Because these are geographical data, we will also use R as a Geographical Information Systems (GIS) environment to map and spatially examine data.

1.) SETUP

A. Retrieve and Set Your Working Directory

```
rm(list=ls())
getwd()
setwd("~/GitHub/PeloncilloProject")
```

B. Load Packages

We will use the **vegan** package for biodiversity estimators and related functions. We will also use a suite of six packages developed in R for geographical information systems (GIS). Be sure to run **install.packages(PackageName)**, if not previously installed, where **PackageName** is the name of the package you want installed. Or, run **install.packages(PackageName, type="source", dependencies=TRUE)**, if the previous command doesn't work.

```
require("vegan")

require("sp")           # Classes and methods for handling spatial data
require("geoR")         # Methods for geostatistical analyses
require("rgdal")        # Geospatial Data Abstraction Library
require("raster")       # Methods to create a RasterLayer object
require("RgoogleMaps")  # For querying the Google server for static maps.
require("maptools")     # Tools for manipulating and reading geospatial data
```

C. Load a .csv file

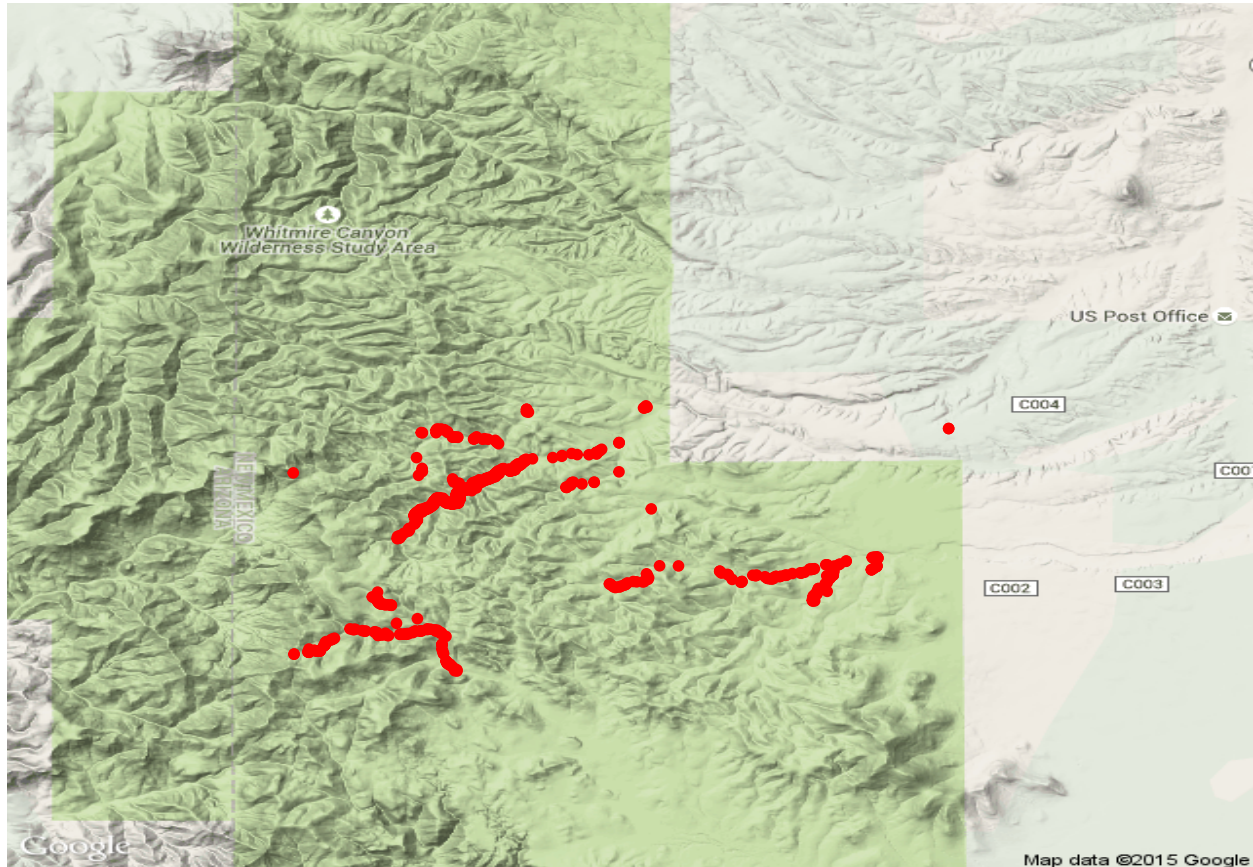
```
Waypoints <- read.table(file="~/GitHub/PeloncilloProject/WayPointData/May2015/csv_files/All_units.csv",
  lats <- as.numeric(Waypoints$Latitude) # latitudes (north and south)
  lons <- as.numeric(Waypoints$Longitude) # longitudes (east and west)
```

If you're using RStudio, take a look at the **Environment** tab in the upper right of the console. There, you can see that the waypoints file was imported as an R data frame.

2.) MAP SOME WAYPOINTS

Let's visualize the spatial distribution of our samples with a basic map in RStudio. Let's generate a map of the refuge ponds using the `GetMap` function in the package `RgoogleMaps`. This map will be centered on the main Peloncillo Project study area ca. 31.52 latitude, -108.98 longitude.

```
newmap <- GetMap(center = c(31.52, -108.98), zoom = 12, destfile = "PeloncilloMap.png",  
                 mptype="terrain")  
PlotOnStaticMap(newmap, zoom = 10, cex = 2, col='blue') # Plot map in RStudio  
PlotOnStaticMap(newmap, lats, lons, cex=1, pch=20, col='red', add = TRUE)
```



Note how this simple Google map was called within an Rscript, meaning R can not only do GIS but can easily access data from the internet, and then pull the data, code, figures, etc. together into a LaTeX pdf.

This map displays a lot of useful information that we otherwise, would not have been aware of. For example, all but one points is on National Forest land and most are appear to occur within canyons.

But, despite being a fast way to contextualize our waypoints within the broader landscape, the Google map misses a lot of information that would otherwise help us to understand the environmental and geographical factors that may coincide with our observations on diversity. Likewise, because the Google map is only an image, it doesn't contain any extractable environmental or geographic data.

For spatially explicit data on environmental and geographic features, i.e. geospatial data, we can turn to one of the many freely accessible online GIS databases and warehouses.

More to come...