Lab Assignment 1 – Working with spatial data in R

WFSC 570 Wildlife Habitat Analysis

For this assignment, you will practice working with spatial data in R using the terra package. You will read point and raster data into R, create new rasters in R representing multiple landscape features, extract those feature values using buffers around your point data, and use the resulting data to conduct a very simply analysis.

The point data comes from amphibian surveys conducted by the University of Arizona’s Frog Project which works out of the Bauder Lab at the Arizona Cooperative Fish and Wildlife Research Unit. Each year, our crews conduct multiple nocturnal visual encounter surveys at a series of sites in southern Pima and Santa Cruz Counties. Most sites are stock tanks but there are some Cienega and riverine sites. The purpose of these surveys is to monitor the presence of federally threatened Chiricahua leopard frogs and invasive American bullfrogs and remove the latter if detected. Other southeast Arizona herpetofauna are often detected during these surveys.

In this assignment, you will look at some of the species detected during these surveys and determine if landscape features are different between sites where a species was detected and sites where the species was not detected.

The data for this assignment include the following:

* A CSV text file including the UTM coordinates (NAD 83 UTM Zone 12N) of each site and a single column denoting whether the following species were detected:
  + Sonoran mud turtles
  + Sonoran desert toads
  + Black-necked gartersnakes
  + American bullfrogs (*Rana catesbeianus*) – RACA
* A TIFF file of the 2021 NLCD land cover for the study area
* A TIFF file of a digital elevation model showing elevation in meters for 30-m pixels

Your assignment is to work in pairs, complete the following tasks and answer the following questions as a pair, and submit a single written report for each pair describing how you completed the tasks and your answers to the questions. Reports should be written using complete sentences and paragraph structure. Also include your R script (either as a separate file and copied-and-pasted into the end of your report).

**Tasks**

* Create a SpatVector using the CSV file of site locations and data
* Create at least two SpatRaster objects representing two landscape features that could be used as covariates in an analysis of the habitat associations of at least one species. You get to choose both the landscape features and the species.
* Extract values for each landscape feature at some buffer around each site. You may use the same buffer for each feature or a different buffer for each feature.
* Create boxplots describing the distributions of each feature at sites where the species was detected and sites where the species was not detected.
* Use a t-test (R function *t.test()*) or a Mann-Whitney test (R function *wilcox.test()*) to compare the values of each landscape feature between sites where your focal species was and was not detected.

This assignment will be due on D2L by the beginning of lab (2:00) on Tuesday September 10, 2024.