**Reclassifying rasters, species richness, and zonal statistics**

**Aim: Use species distribution information to calculate species richness over a region and within parks**

**Part 1: Reclassifying rasters**

Species distribution models represent habitat suitability based on input predictor variables. Maxent is a very common popular species distribution modeling algorithm. Maxent models can be projected onto geography to represent the suitability for a species with values ranging from 0 (not suitable) to 1 (very suitable).

These models can also be thresholded to represent binary maps of presence and absence for a species. By combining species ranges in this way, measures of species richness can be calculated over large geographic areas. Assumptions regarding distribution models must be acknowledged (such as the possibility of biotic interactions changing a species’ range, local adaptations, etc.) and a large body of literature surrounds SDMs.

1. I created SDMs for the carnivores of Madagascar. Take a few moments to explore what the models looks like. Then, convert the models from continuous rasters to binary – showing areas of suitable and unsuitable. For each raster, threshold the model at the levels indicated below.

|  |  |
| --- | --- |
| **Species** | **Threshold** |
| *Cryptoprocta ferox* | 0.858008 |
| *Fossa fossana* | 0.753103 |
| *Galidia elegans* | 0.863846 |
| *Galidictis grandidieri* | 0.923044 |
| *Herpestes javanicus* | 0.79818 |

Use the raster calculator to threshold the models so that values below the threshold are 0 and values above the threshold are 1. Remember to use the buttons as much as possible.

( "Cryptoprocta\_ferox@1" < 0.85 ) \* 0 + ( "Cryptoprocta\_ferox@1" >= 0.85 ) \* 1

**Part 2: Calculate species richness**

Species richness is defined as the number of species in a given area. Here, we can calculate species richness of carnivores over all of Madagascar.

1. Using the raster calculator, add the rasters together. Change the color palette so that it makes sense.

**Part 3: Zonal statistics**

1. Load the protected areas raster. This is a rasterized version of a protected areas shapefile provided by Steven Goodman.
   1. Using the raster calculator, mask the richness layer by the protected areas to see only the richness of carnivores within protected areas of Madagascar.
      1. (mask@1 >= 0) \* clip@1
   2. The resolution of these rasters is 2.5 arc-minutes. If 30 arc-seconds is roughly 1 km (at the equator-remember that this will shrink as you go towards the poles), what is the rough resolution of this raster in km?
   3. Using the raster calculator again, find out the total area of protected habitat that has 3 carnivores. ( "raster@1" = 3 ) \* "raster@1"
   4. Use the “Raster layer statistics” tool to find out how many pixels have the maximum number of carnivores.
      1. Hint: You will need to reclassify this raster using one of the above steps.
      2. What is the total protected area that has the maximum number of carnivores?

**Deliverable:** create a map of Madagascar showing the species richness of carnivores and the total protected area that has 3 carnivores.