

## A17: Working with and Analyzing Raster Data in R (1)

Your results should be delivered as an HTML webpage generated using R Markdown or Quarto. Make sure to include all code and results along with the answers to the questions. Provide text to describe your methods and results. This should read like the Methods and Results sections of a paper. You will primarily use the terra package to complete this assignment.

### Grading Criteria

- Correctness and completeness of code (16 Points)
- Description of process and results (12 Points)
- Webpage formatting (8 Points)
- Map output (6 Points)

In this assignment, you will work with and analyze raster geospatial data in R. Specifically, you will create two models to predict where a certain tree species might grow. The first model will be a conservative or binary model in which cells are coded as 1 (habitat) or 0 (not habitat). The second model will be a liberal model in which weighted overlay is used to create an index to indicate the suitability of each cell location.

You have been provided with the following layers:

1. **elev.tif**: elevation in meters from National Elevation Dataset (NED)
2. **lc.tif**: land cover from National Land Cover Database (NLCD) (41 = deciduous forest, 42=evergreen forest, 43= mixed forest, full legend can be found at: [https://www.mrlc.gov/nlcd11\\_leg.php](https://www.mrlc.gov/nlcd11_leg.php))
3. **slp.tif**: topographic slope in degrees calculated from elevation data
4. **strms.tif**: streams as a raster grid

### **Binary or Conservative Model**

The species of interest will likely be found or grow at locations that meet **all** of the following criteria:

1. Elevations greater than 1,300 meters
2. Land cover of evergreen **or** mixed forest types
3. Slopes greater than 10 degrees
4. Within 1 km (1,000 meters) of a stream

Create a model to represent these criteria. Deliver the code and produce a map of the result using **tmap**. The map should use an appropriate color scheme and have a title and informative legend.

### **Liberal or Weighted Overlay Model**

The species of interest will likely be found or grow at locations that meet **all** of the following criteria:

1. High elevations
2. Forested land cover
3. Steep slopes
4. Close to streams

Create a model to represent these criteria. Deliver the code and produce a map of the result using **tmap**. The map should use an appropriate color scheme and have a title and informative legend.

- Re-scale the elevation measurements so that the highest elevation is 1 and the lowest elevation is 0.
- Code all land cover types that are not forest to 0, deciduous forest to 0.5, mixed forests to 0.8, and evergreen forests to 1.
- Re-scale slope so that the steepest slopes are 1 and the flattest areas are 0.
- Re-scale the distance from streams grid so that the cells closest to streams are 1 and the cells furthest from streams are 0.

- Create the weighted overlay model using the following weights:
  - Elevation = 0.3
  - Forest Type = 0.2
  - Slope = 0.2
  - Distance from Stream = 0.3