

## A18: Working with and Analyzing Raster Data in R (2)

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.

### Grading Criteria

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

In this exercise, your goal is to develop a model to predict areas that meet the site characteristics required for an invasive species to thrive. You will generate a binary or conservative model with a 30 m spatial resolution covering a seven county area in the Allegheny Highlands of West Virginia. You have been provided with the following data sets:

1. **counties.shp**: vector polygon county boundaries
2. **lc.tif**: 30 m spatial resolution land cover from the National Land Cover Dataset (NLCD (2011)). Here is a link to the legend for these data: <https://www.mrlc.gov/data/legends/national-land-cover-database-2019-nlcd2019-legend>.
3. **elev.tif**: 30 m spatial resolution digital elevation model (DEM) derived from the National Elevation Dataset (NED) with elevation in meters.

Here are the criteria required for the invasive species:

1. Elevations above 1,000 meters
2. In Evergreen (42) or Mixed forest (43) types.
3. At slopes less than 15°
4. At aspects between 22.5° and 157.5°

Create the model using the terra package. Use the results and the provided county boundaries to obtain the estimated percent and land area of each county that are predicted to be suitable for the invasive species. Create a single layout that contains three maps: the raster-based model, county-level total areas, and county-level percent of areas that may be impacted. In your results, you should discuss which counties are most at risk based on overall land area and percent of land area.