

AN INTRODUCTION TO SPATIAL ANALYSES IN R: COMPARISONS TO ARCGIS

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What is R?

- Open source programming language
 - Statistical computing and graphics
- Stems from Bell Labs S language
- R created by Ross Ihaka and Robert Gentleman (New Zealand)
 - First released in 1993
 - Maintained by R Core Development Team
 - *32bit* and *64bit* versions available (use simultaneously)
 - Current release is 3.1.0

R-Studio Interface – 4 Panes

The image displays the R-Studio interface with four panes highlighted by colored boxes and labels:

- Source – Write Code Here:** The top-left pane, outlined in green, contains R code for a spatial analysis demo. The code includes comments and functions for creating data frames and calculating averages and standard deviations. A grey label is overlaid on the code.
- Console – Code 'Executed' Here:** The top-right pane, outlined in blue, shows the output of the executed code. It displays the R version (2.15.3), copyright information, and the results of the code execution, including the creation of data frames and the calculation of averages and standard deviations. A grey label is overlaid on the console output.
- Workspace – Display of In-Memory Objects:** The bottom-left pane, outlined in pink, is currently empty, indicating that no objects are currently loaded in the workspace. A grey label is overlaid on the workspace area.
- Help, Plots & Packages:** The bottom-right pane, outlined in yellow, shows the documentation for the `sampleRandom` function. It includes a description, usage instructions, and a list of arguments. A grey label is overlaid on the help text.

Data Frames = Tables in R

- `data.frame(matrix/vector) ... use []` to go to specific rows and/or columns
- Example of using a data.frame named 'df'. Can represent each cell using:
 - Indexes – `df[row, col]` where row and col are index numbers beginning with 1
 - Character strings – `df["rowname1", "colname1"]`

| Obj= df | colname1 | colname2 | colname3 |
|----------|-----------|------------|------------|
| rowname1 | [1,1] = 4 | [1,2] = 5 | [1,3] = 6 |
| rowname2 | [2,1] = 8 | [2,2] = 10 | [2,3] = 12 |

Using R Studio (DEMO)

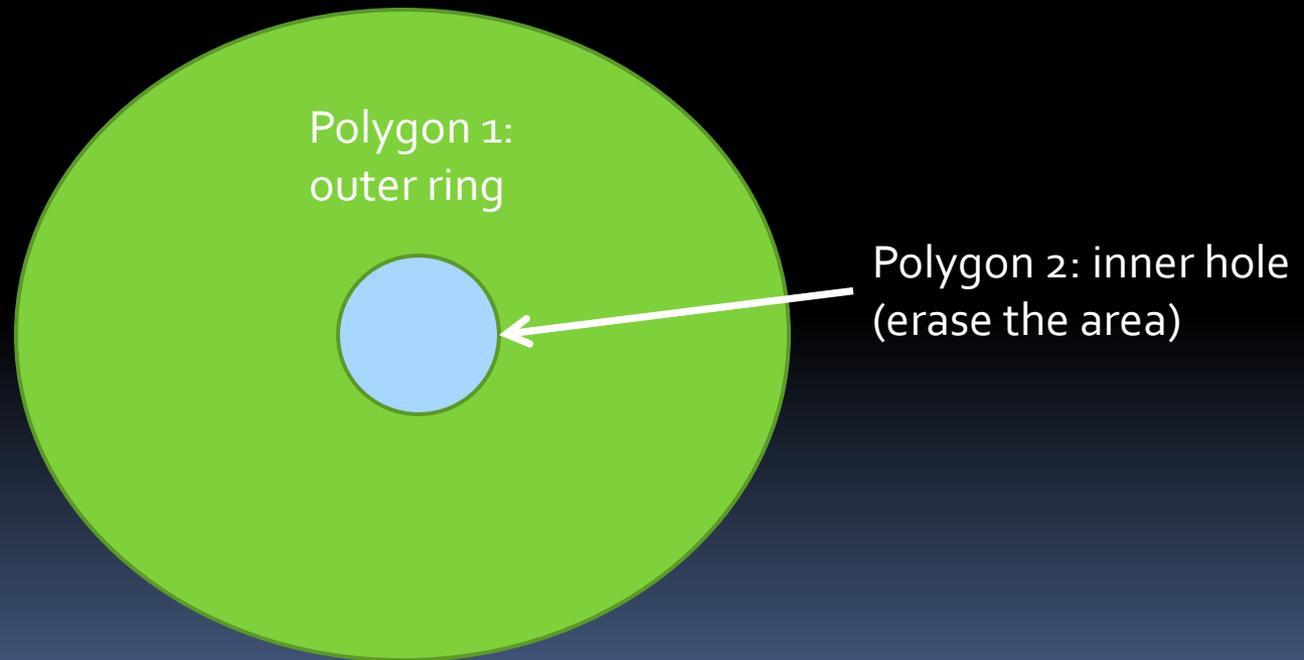
Spatial Analyses with R

- R can do many of the same functions as ArcGIS
- R requires certain 'packages', just like ArcGIS Extensions
 - Vector data packages: sp, rgeos, maptools, rgdal
 - Raster data packages: raster, rgdal
 - Projection package: rgdal

Polygon: polygons slot

Hypothetical situation where it requires two polygons to describe 1 feature

- `poly@polygons` :List of 1
 - `poly@polygons[[1]]@Polygons`: List of 2



Vector Demos

■ ArcGIS Tool

- Intersect (Analysis/Overlay)
- Buffer (Analysis/Proximity)
- Erase (Analysis/Overlay)
- Near (Analysis/Proximity)

■ Program R Function

- gIntersection (rgeos)
- gBuffer (rgeos)
- gDifference (rgeos)
- gDistance (rgeos)

Raster Demos

- ArcGIS Tool
 - Euclidean Distance (Spatial Analyst/Distance)
 - Extract by Mask (Spatial Analyst/Extraction)
 - Slope (Spatial Analyst/Surface)
 - Composite Bands (Data Management/Raster/Raster Processing)
 - Extract Values to Points (Spatial Analyst/Extraction)
 - Kernel Density (Spatial Analyst/Density)
- Program R Function
 - distance (raster)
 - crop or mask (raster)
 - terrain (raster)
 - stack (raster)
 - extract (raster)
 - kernel2d (splancs)