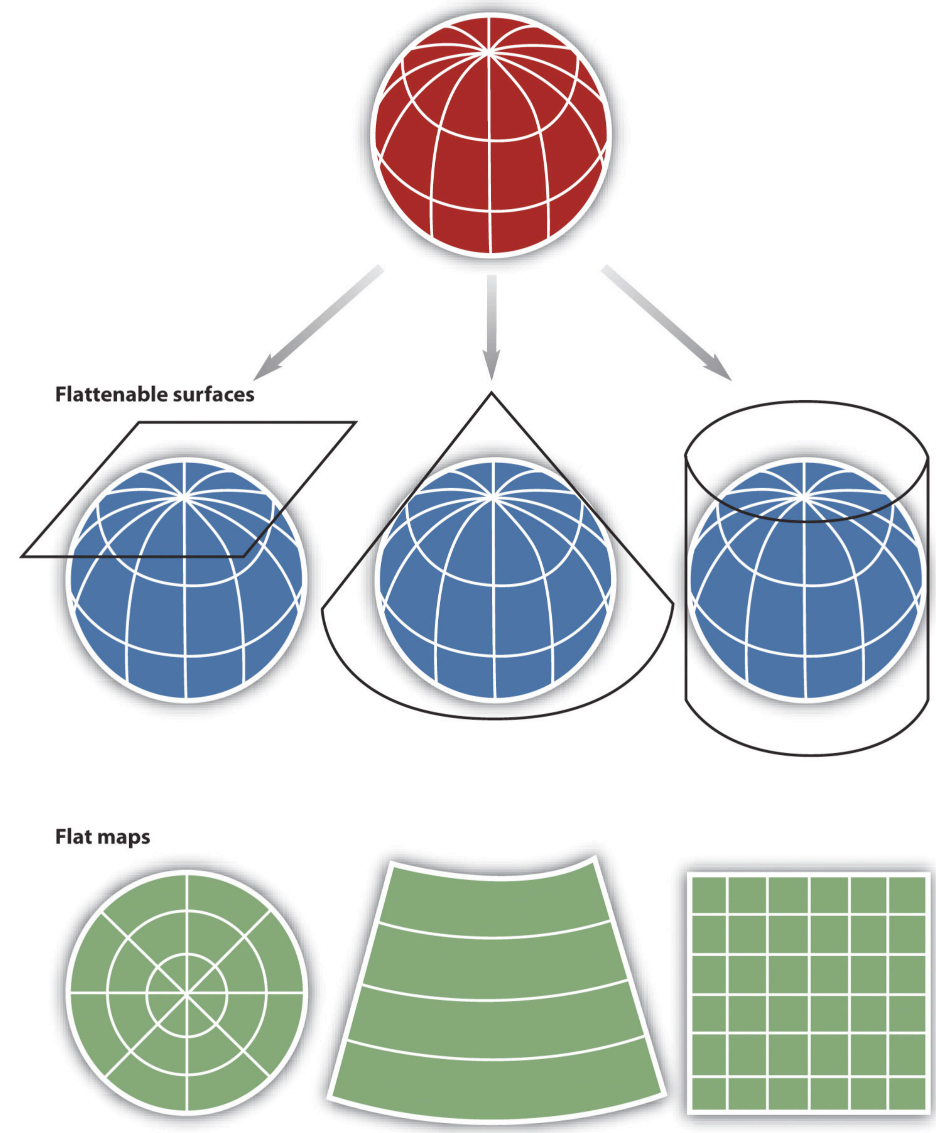
Geospatial Maps in R

Biology 724D:
Foundations of Data Science for Biologists

The Problem: Flattening the Earth



from Campbell and Shin, 2011. Essentials of Geographic Information Systems

Coordinate Reference Systems

1. Geodetic Datum -- assumptions about the shape of the earth (spheroid), center of the planet, origin points for latitude and longitude, etc.

    - World Geodetic System (WGS84) -- common default

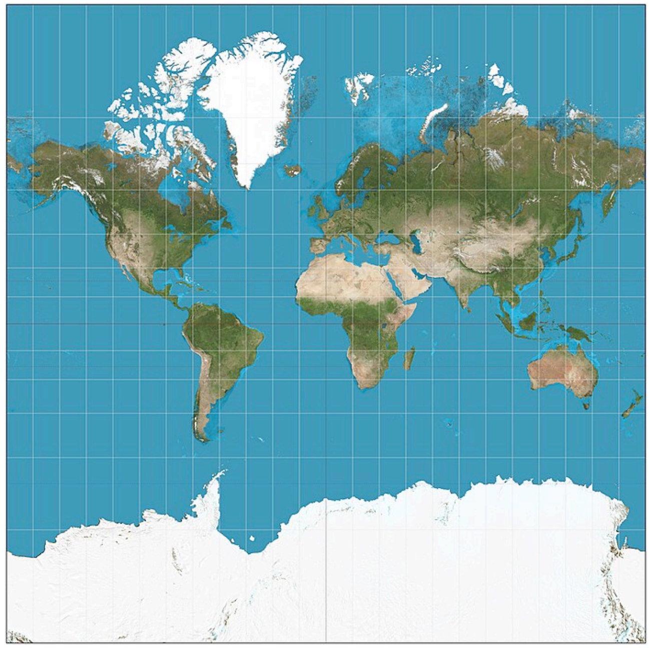
    - North American Datum (NAD83) -- most appropriate for North America

2. Map projection -- mathematical operations required to map points from a 3D object and 2D surface. Area preserving vs Shape preserving.

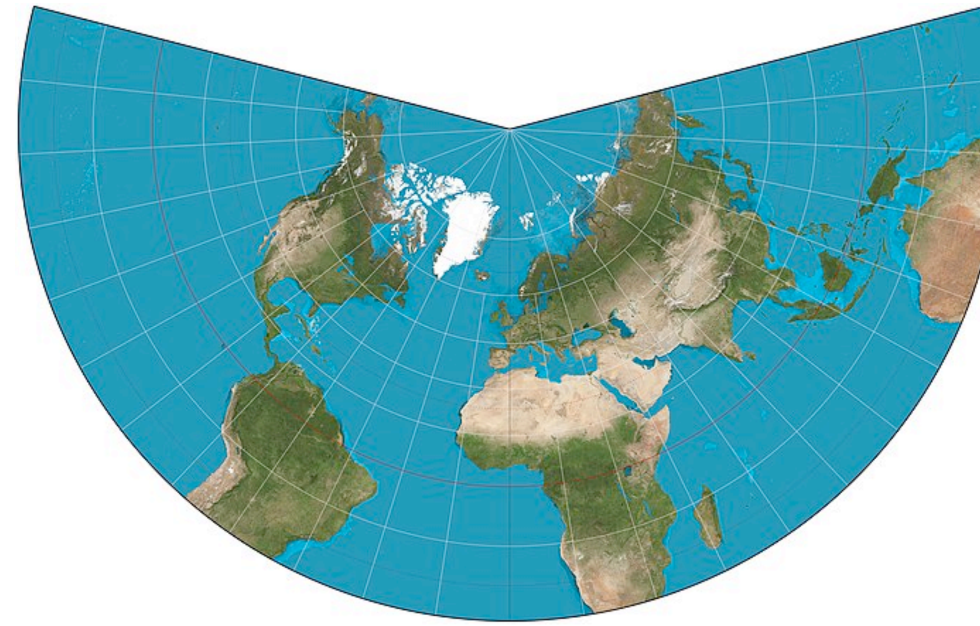
    - e.g. Mercator projection (shape preserving, cylindrical projection), Lambert conformal projection (shape preserving, conical projection), Albers projection (area preserving, conical projection), etc.

3. Parameters of the projection -- origin and bounds

Map Projections: Examples

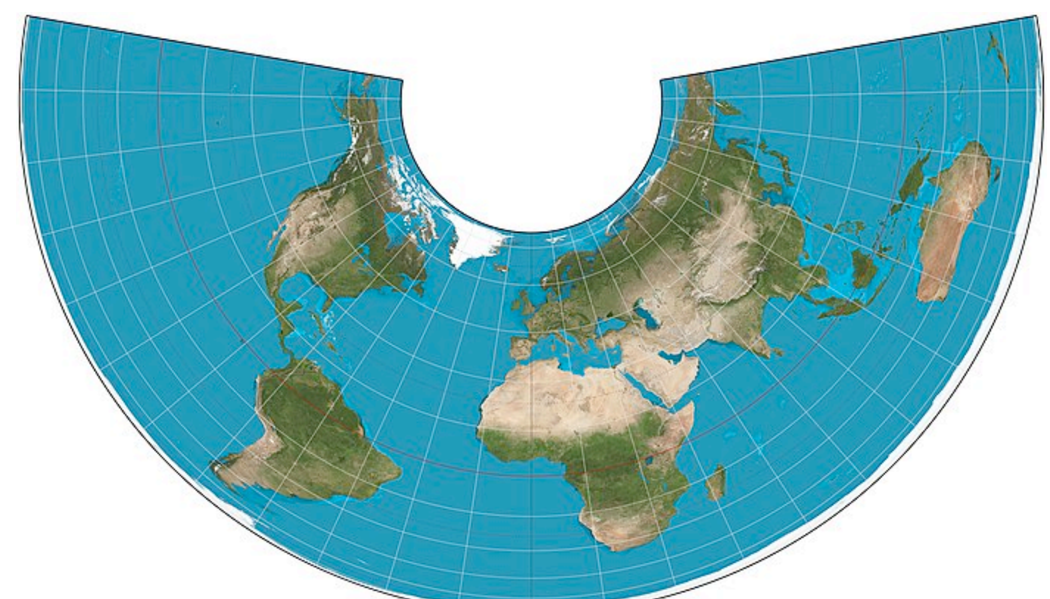


Mercator conformal



Lambert conformal

Lambert azimuthal equal area



Albers equal area

Representing spatial features

- Problem: What spatial features do we want to map and how do we represent them?
- "Simple Features" files:
  - "Simple Features (officially Simple Feature Access) is a set of standards that specify a common storage and access model of geographic features made of mostly two-dimensional geometries (point, line, polygon, multi-point, multi-line, etc.) used by geographic databases and geographic information systems. It is formalized by both the Open Geospatial Consortium (OGC) and the International Organization for Standardization (ISO)." (source: Wikipedia)

sf: Simple Features for R

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R: Mapping and Geospatial

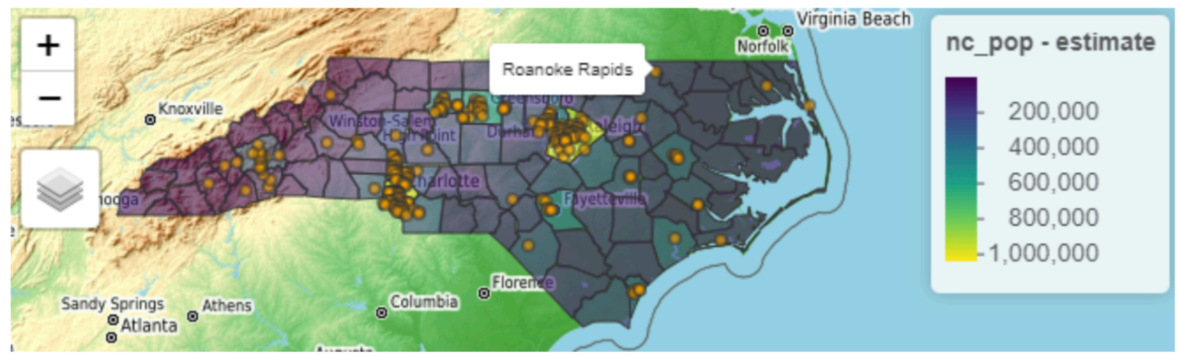
Geospatial applications using the R programming language

- **Overview**
- **Getting Data**
- **Preparing Data and Joining More Data**
- **Geocoding**
- **Visualizing**
- **Raster Data**
- **Projections / CRS**
- **Output**
- **Related GIS Guides**

Created using R

Overview

Introduction | Tutorials | Contacts for more help



- *Spatial Data Science*
  Book by Edzer Pebesma and Roger Bivand. Focuses on the tidyverse packages to perform geospatial analysis in R.
- *Geocomputation with R*
  Online book by Robin Lovelace, et al. covering both vector and raster mapping. Generally uses the tidyverse packages.
- Get Spatial! Using R as GIS
  "Intended to introduce you to the different spatial data types and how to create, read, manipulate and analyze spatial data in R."
- CRAN Task View: Analysis of Spatial Data
  An overview of R packages used for spatial data analysis and visualization.
- An Exploration of Simple Features for R
  Extensive blog post by Jesse Sadler about R's **sf** package, implementing the Simple Features standard into R and fitting nicely into the tidyverse set of packages.
- Introduction to visualising spatial data in R
  20-page PDF by Robin Lovelace, et al. Overview on R's spatial functions, projections, and creating thematic maps.