Chapter 14

Fundamentals of Data Visualization

May 2, 2023

Visualizing geospatial data

- Many datasets contain information linked to locations:
    - where specific plants or animals have been found
    - where people with specific attributes (such as income, age, or educational attainment) live
    - where man-made objects (e.g., bridges, roads, buildings) have been constructed
- Maps tend to be intuitive to readers but they can be challenging to design.
- The choropleth map represents data values as differently colored spatial areas.
- Cartograms purposefully distort map areas or represent them in stylized form, for example as equal-sized squares.

World coordinates

- To specify a place: latitude, longitude, altitude
- A reference system for these is called a **datum**
- One widely used datum is the World Geodetic System (WGS) 84, which is used by the Global Positioning System (GPS).

World coordinates

- Frequently altitude is not recorded.
- Lines of equal longitude are **meridians**
- Lines of equal latitude are called **parallels**
- The **prime meridian** is at $0°$ longitude
- The **equator** is at $0°$ latitude

Projections

- In map-making we need to take the spherical surface of the earth and flatten it out.
- This projection introduces distortions.
- The projection can preserve either angles or areas.
- A projection that preserves angles is called **conformal**.
- A projection that preserves areas is called **equal-area**.
- Other projections may instead preserve other quantities of interest, such as distances to some reference point or line.
- Some projections attempt to strike a compromise between preserving angles and areas.
- These compromise projections are frequently used to display the entire world in an aesthetically pleasing manner.
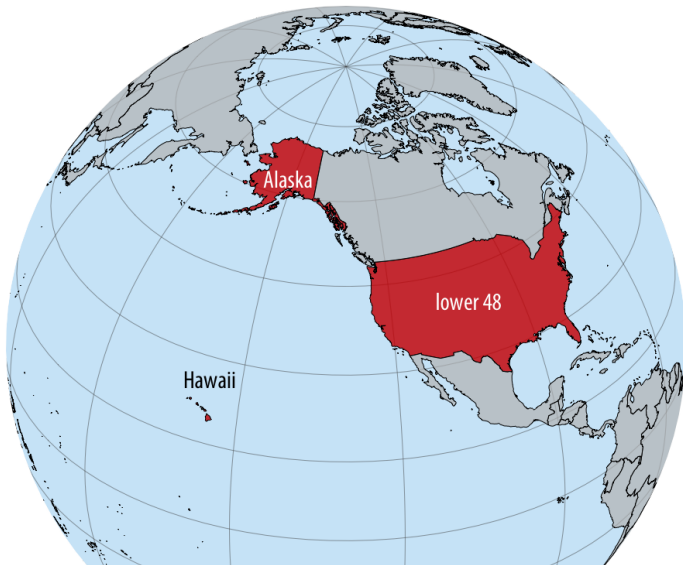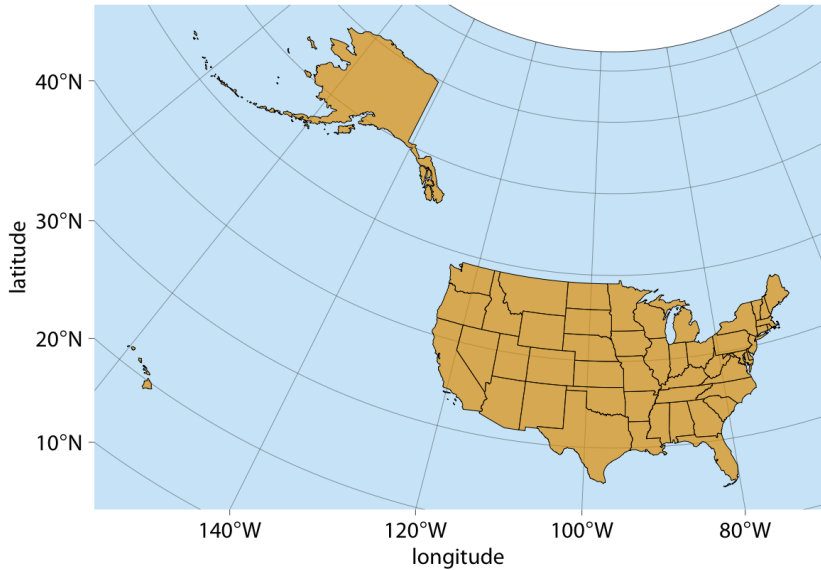
Mercator: a conformal projection
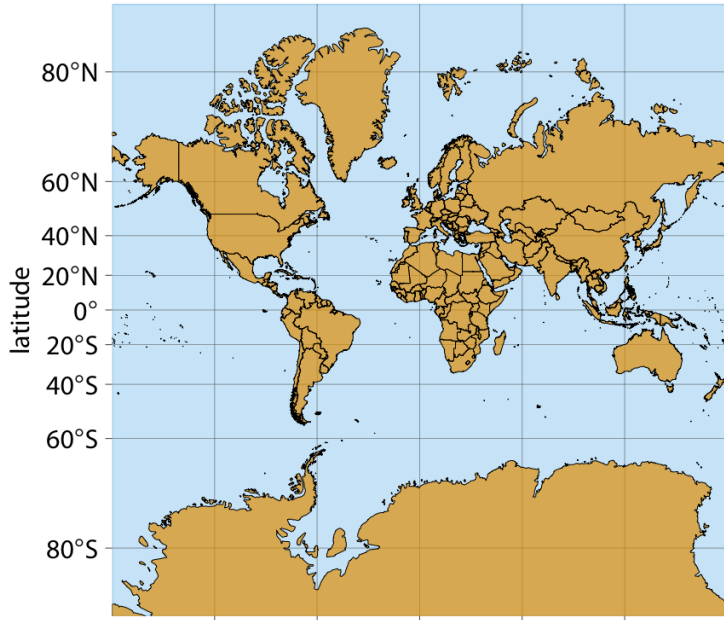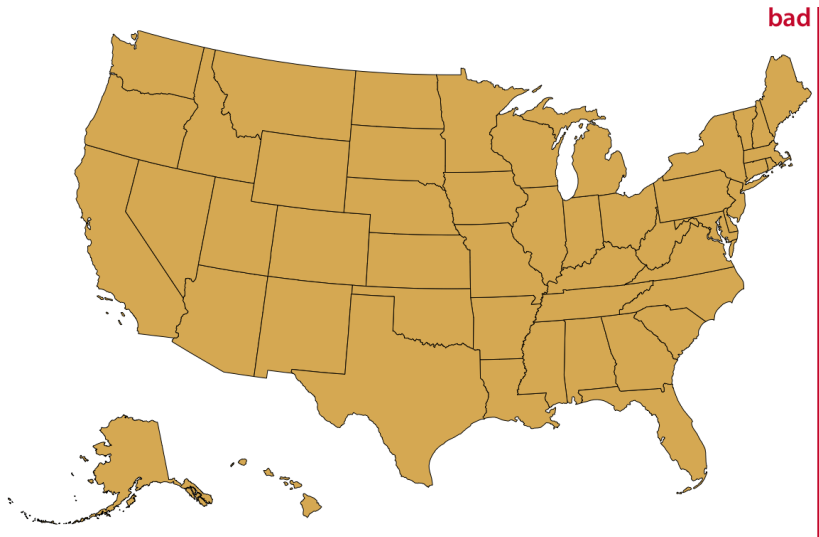
Goode homolosine: an equal-area projection
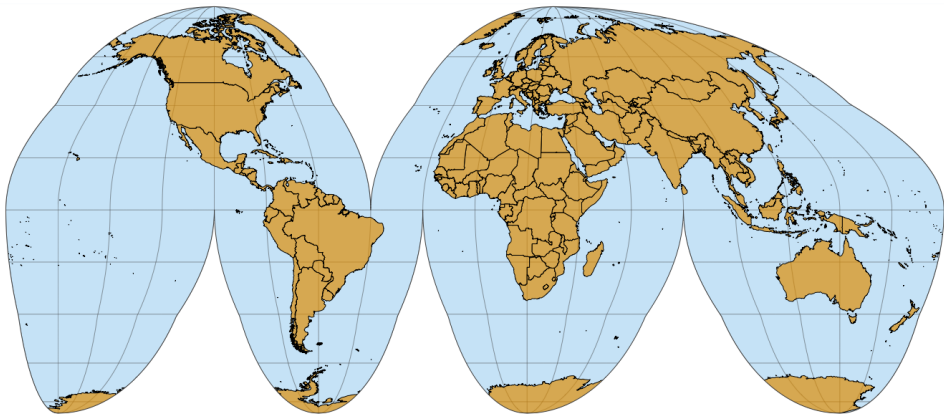
A challenge: the USA

Equal-area Albers projection

Common practice

bad

Preserving areas