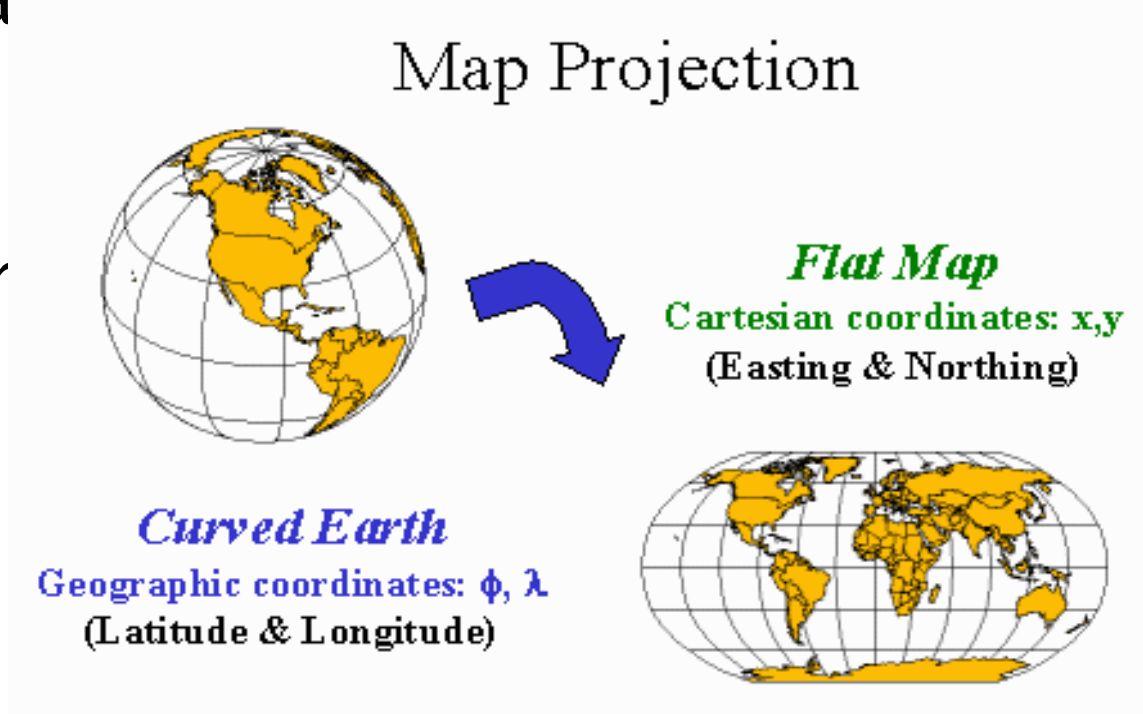
Map Projections and Geodesy

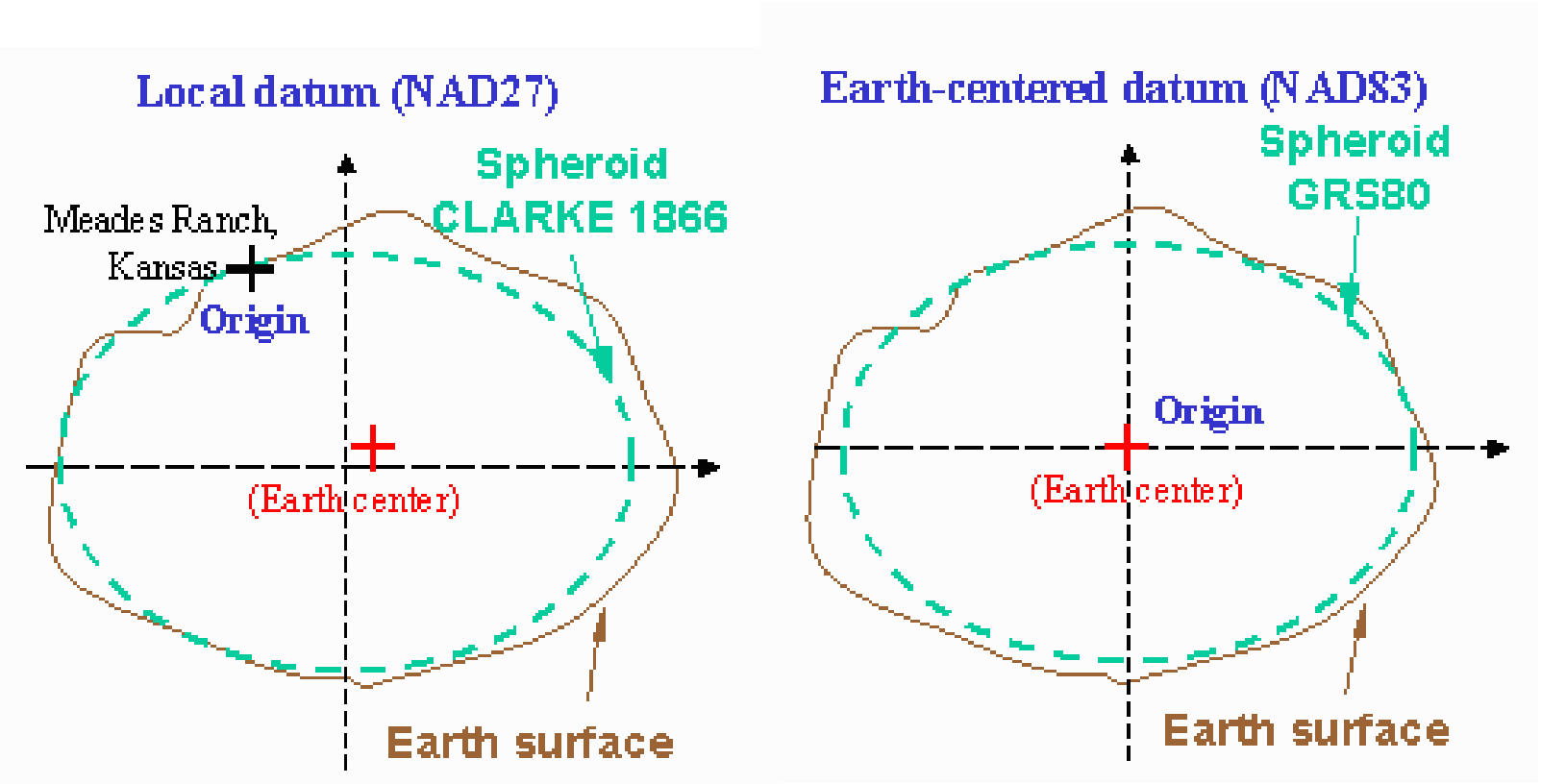
Map Projections and Geodesy

- With a GIS you still have to project 3D globe on a 2D surface
- Must choose the appr



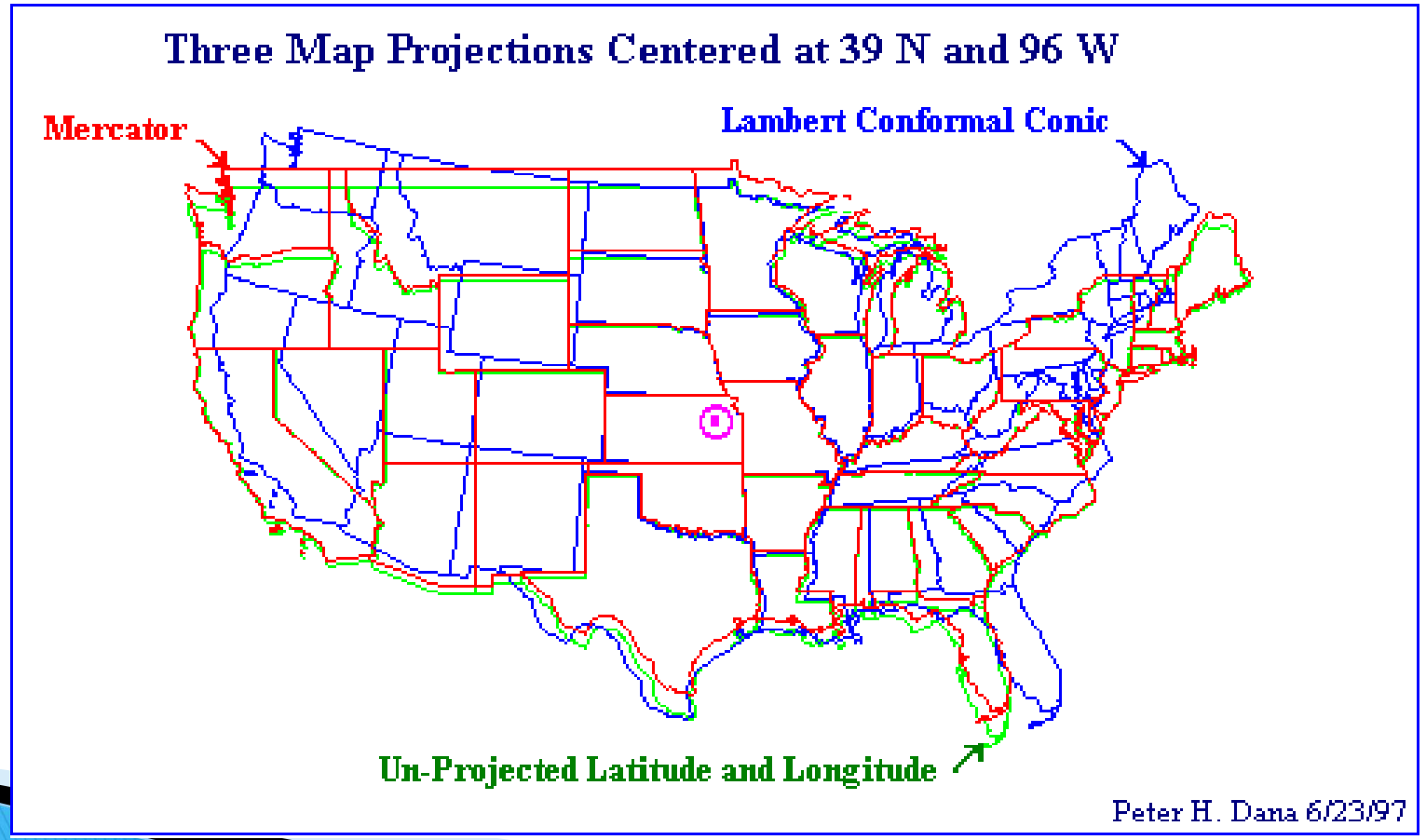
Projections and Datums

- You must decide what horizontal datum to use.



Projections and Datums

- You must decide what map projection to use



Projections and Datums

- GIS systems allow you to convert among projections and datums efficiently.

Projections and Coordinates

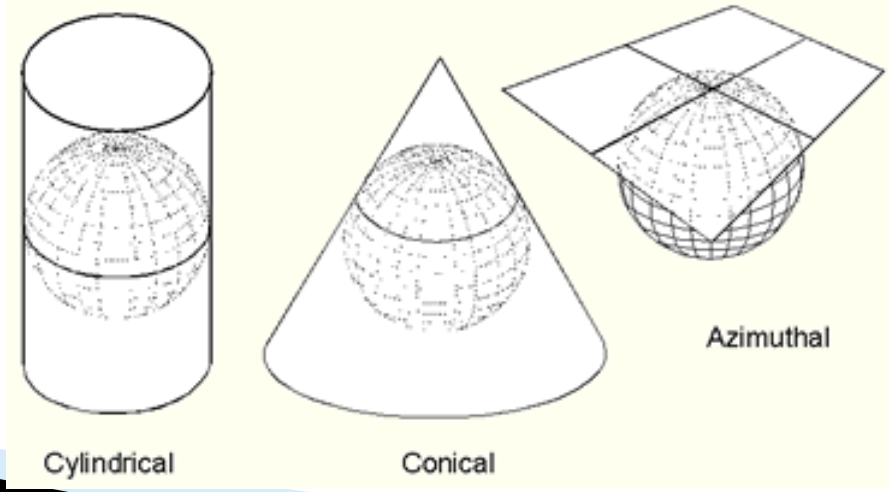
- There are many reasons for wanting to project the Earth's surface onto a plane, rather than deal with the curved surface
  - The paper used to output GIS maps is flat
  - Flat maps are scanned and digitized to create GIS databases
  - Square and rectangular rasters are flat
  - The Earth has to be projected to see all of it at once
  - It's much easier to measure distance on a plane

Distortions

- Any projection must distort the Earth in some way
- Two types of projections are important in GIS
  - Conformal property: Shapes of small features are preserved, or in other words, scales of the projections in x and y directions are always equal
  - Equal area property: Shapes are distorted, but areas measured on the map are always in the same proportion to areas on the Earth's surface
  - Both types of projections will generally distort distances

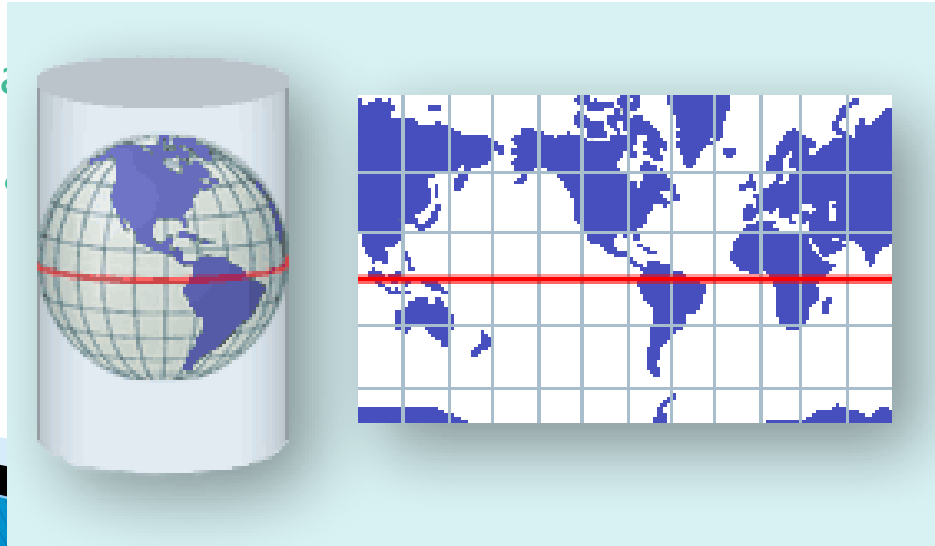
Map projections

- Azimuthal or planar – analogous to touching the Earth with a sheet of flat paper
  - Cylindrical – analogous to wrapping a cylinder of paper around the Earth, projecting the Earth's features onto it, and then unwrapping the cylinder
  - Conical – analogous to wrapping a sheet of paper around the Earth in a cone



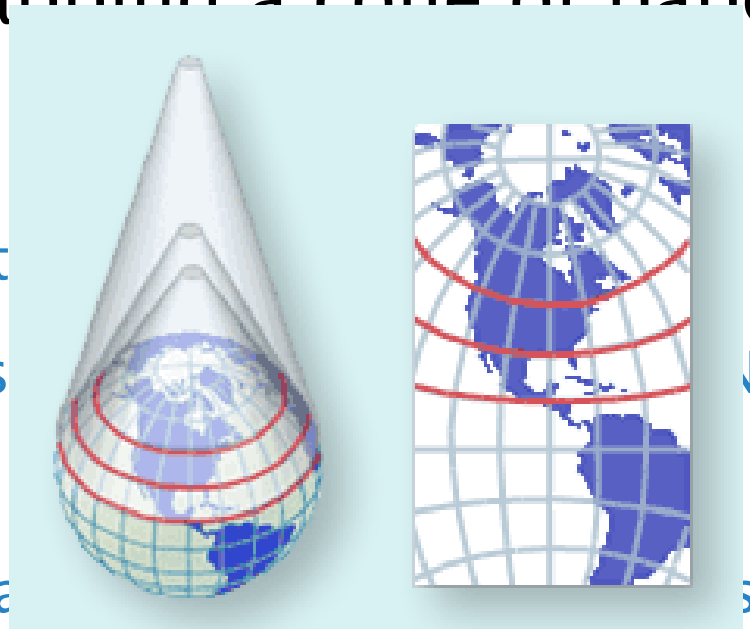
Cylindrical Projections

- The Mercator projection is the best-known cylindrical projection
  - The cylinder is wrapped around the Equator
  - The projection is conformal
    - At any point scale is the same in both directions
    - Shape of small fe
    - Features in high l



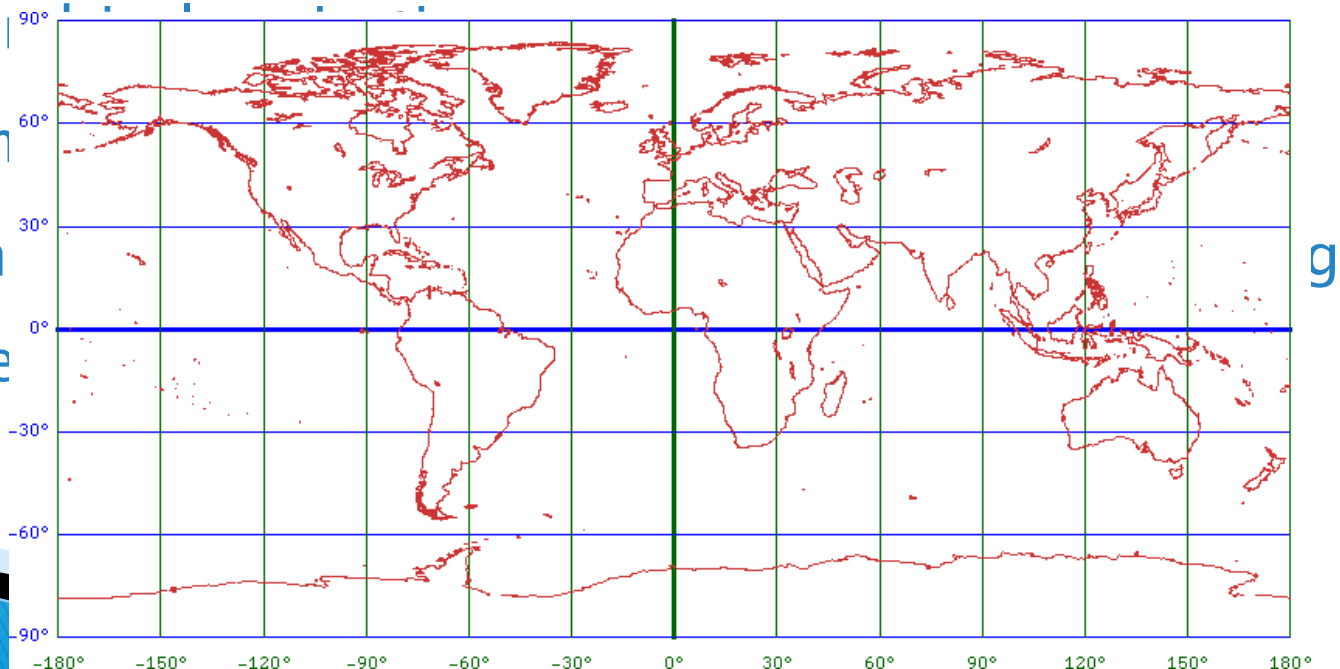
Conic Projections

- Conceptualized as the result of wrapping a cone of paper around the Earth
  - Standard Parallels occur where the cone int
  - The Lambert Conformal Conic projection is North America
  - On this projection lines of latitude appear a s of longitude are straight lines radiating from the North Pole



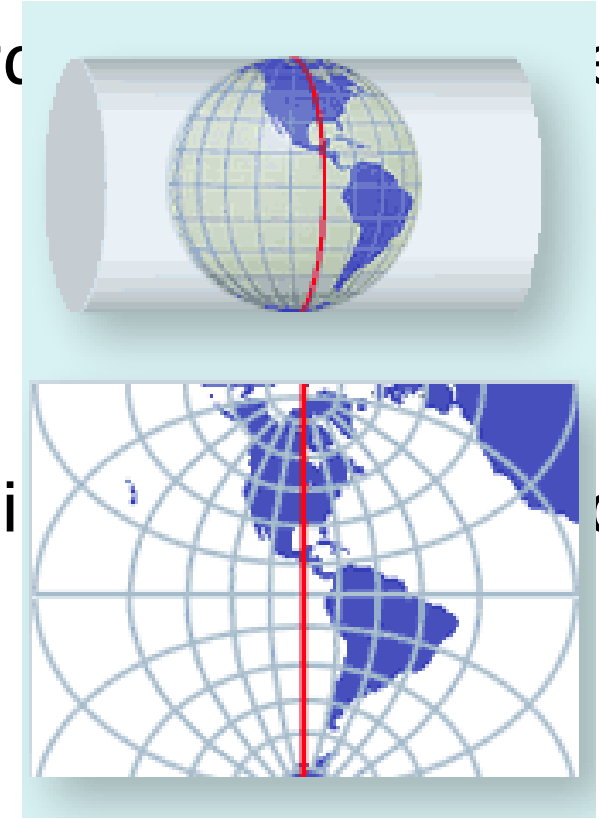
The “Unprojected” Projection

- Assign latitude to the y axis and longitude to the x axis
- Also known as the Plate Carrée or Cylindrical Equidistant Projection
  - A type of cyli
  - Is neither con
  - As latitude in gether on the Earth, but are



The Universal Transverse Mercator (UTM) Projection

- A type of cylindrical projection
- Implemented as an internationally standard[illegible]em
  - Initially devised as a military standard
  - Uses a system of 60 zones
  - Maximum distortion is 0.04%
- Transverse Mercator because the cylinder i[illegible]d the Poles, not the Equator



The Universal Transverse Mercator (UTM) Projection

- Zones are each six degrees of longitude, r ;
  shown at the top, from W to E