Introduction to

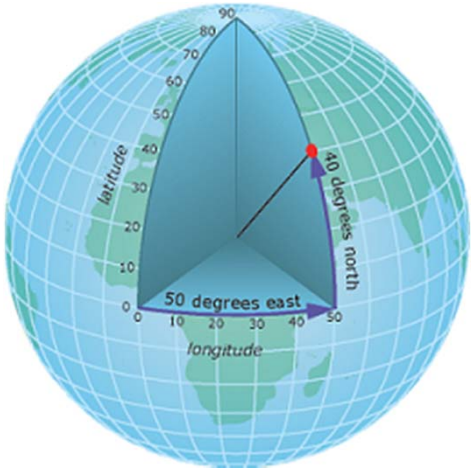
Coordinate Systems and Projections

RICE

Fondren Library
GIS/Data Center

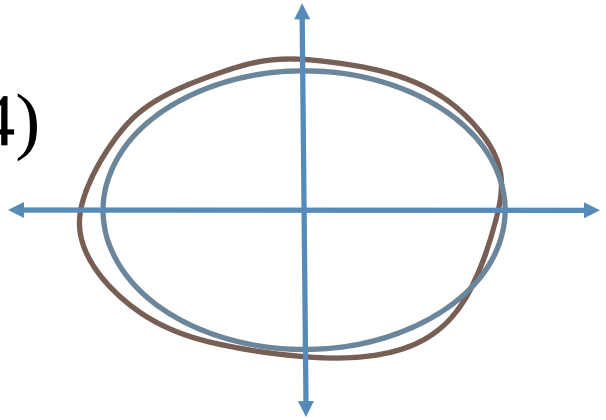
Geographic Coordinate Systems

- A global or spherical coordinate system, or datum, which enables point location on the three-dimensional surface of the Earth
- Measurements of latitude and longitude provided in decimal degrees

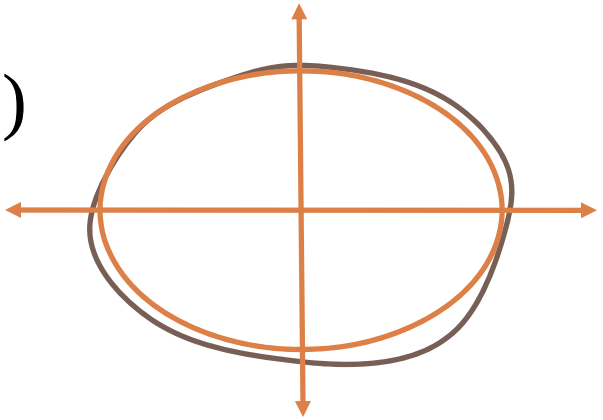


Common Geographic Coordinate Systems

- World Geodetic System 1984 (WGS84)
  - ESRI – “GCS_WGS_1984”
  - Commonly used for world datasets

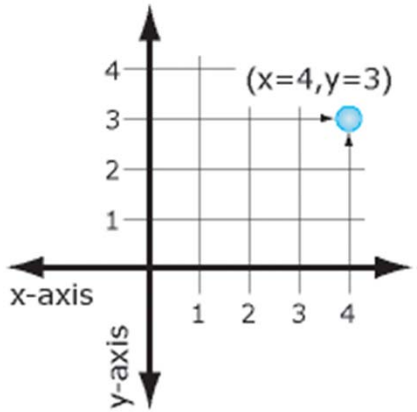


- North American Datum 1983 (NAD83)
  - ESRI – “GCS_North_American_1983”
  - Commonly used for U.S. datasets



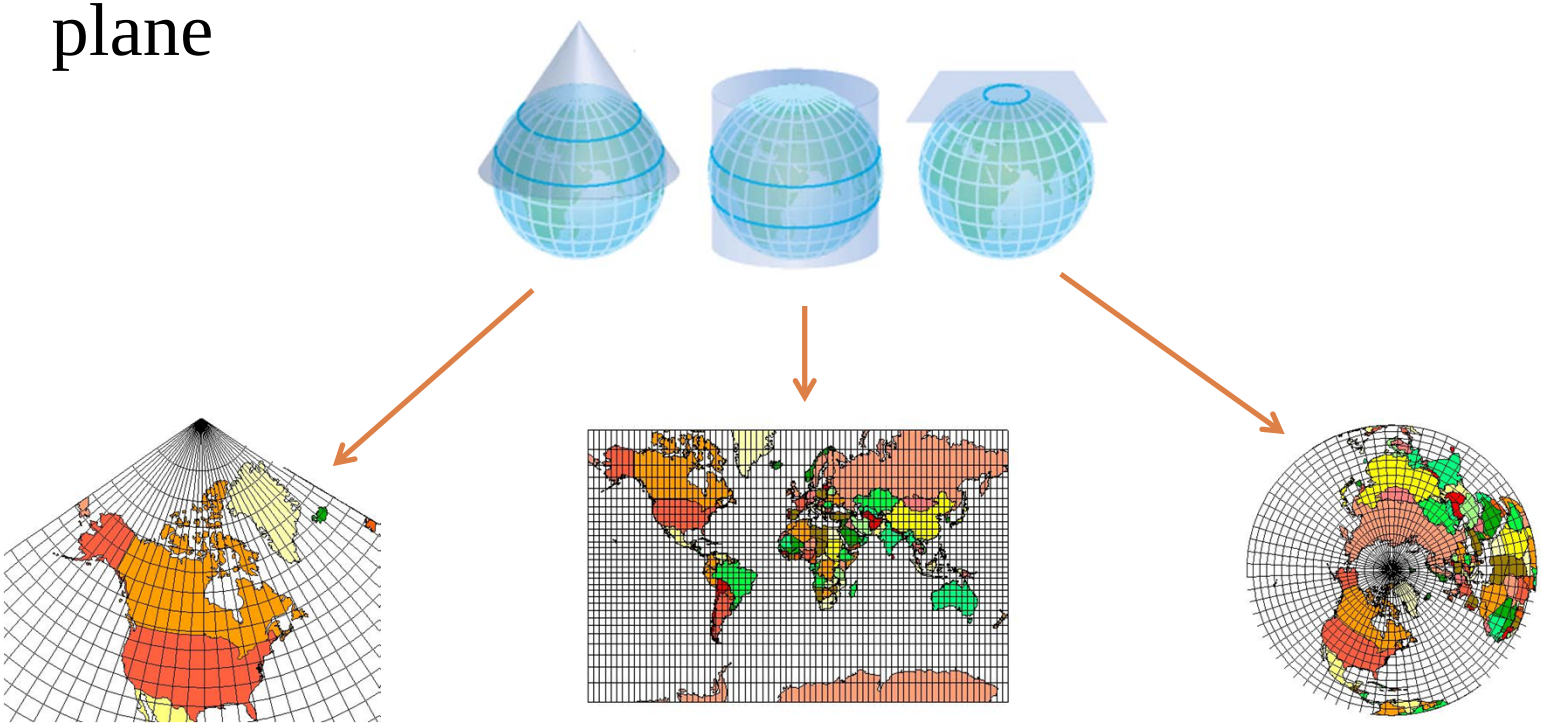
Projected Coordinate Systems

- A planar coordinate system, which enables point location on a two-dimensional plane representing the surface of the Earth
- Measurements of x and y distances provided in the unit of the particular coordinate system (e.g. feet, meters)



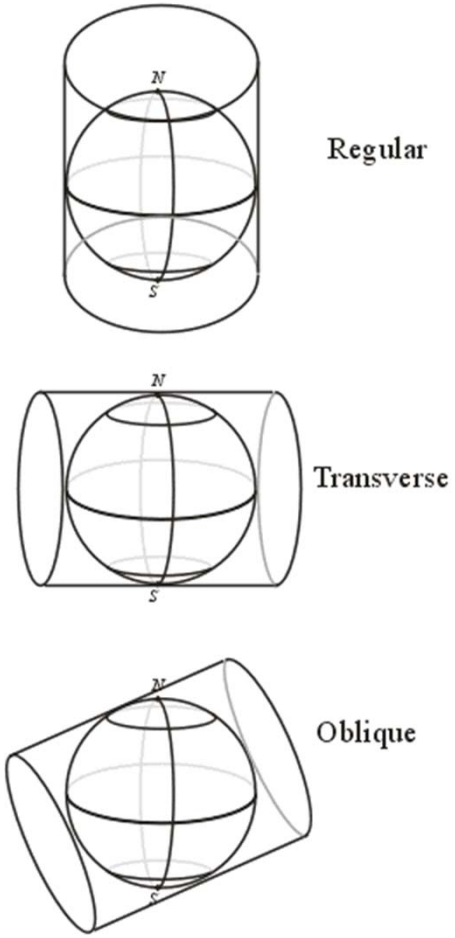
Projection Properties: Surface

- Translates data from a spherical surface to a developable surface, such as a cylinder, cone, or plane



Projection Properties: Orientation

- Describes the orientation of the surface relative to the orientation of the Earth.



Projection Properties: Classification

- Due to the distortions involved in any projection, some spatial characteristics must be sacrificed at the expense of others
  - Direction (azimuthal)
  - Shape (conformal)
  - Area (equal-area)
  - Distance (equidistant)

Common Projected Coordinate Systems

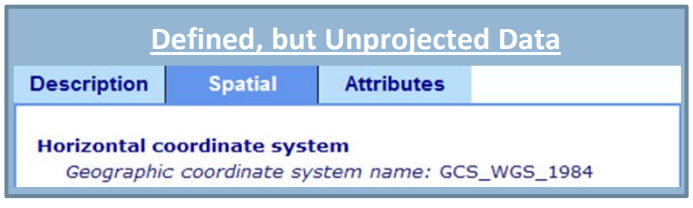
- Albers Equal Area Conic
  - Common for U.S. datasets to preserve area
- Lambert Conformal Conic
  - Common for U.S. datasets to preserve shape
- State Plane Coordinate System
  - Common for local datasets within U.S.

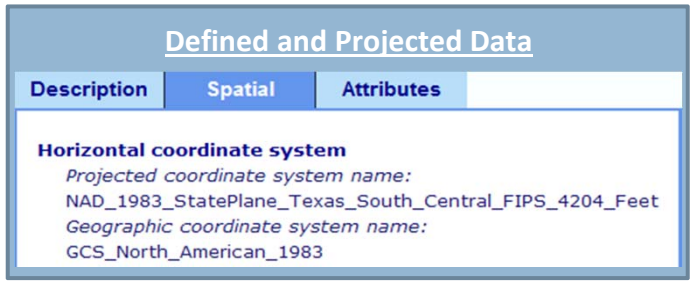
Steps for Defining Data

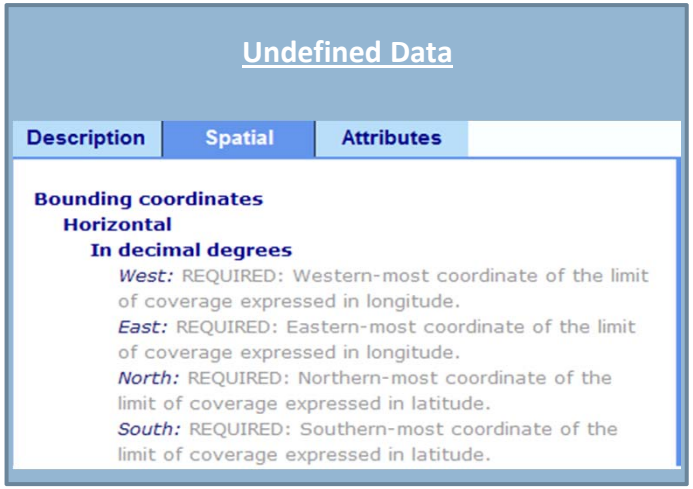
1. Determine if data is defined.
2. Locate metadata for undefined data.
3. Define undefined data based on metadata.

1. Determine if data is defined

- Preview the Spatial metadata in ArcCatalog
  - If a horizontal coordinate system is listed, the file is defined.
  - If a horizontal coordinate system is not listed, the file is undefined.







2. Locate metadata for undefined data

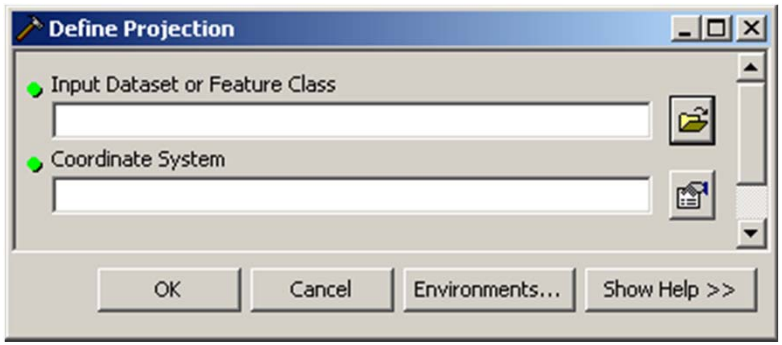
- If the data is undefined, try to locate the projection.
  - Look for a separate file included with the data.
  - Review the website from which the data was downloaded.
  - Communicate with the person who created/distributed the data.

Data Information

Name:	Census 2000 TIGER/Line Data
Provider:	U.S. Bureau of the Census
Coverage:	United States
Coordinate System:	Geographic coordinates **NAD83** for the 48 contiguous states, **NAD27** for Alaska, and Old Hawaiian Datum for Hawaii
Units:	Decimal degrees
Delivery:	Shapefile
Price:	Free

3. Define undefined data

- If you have located the projection, you can define the data using that projection.
- There is only one correct projection: the one from the metadata.
- If you cannot locate the projection, you will need to georeference the data instead.



Steps for Projecting Data

1. Select final map projection.
2. Determine which layers need to be projected.
3. Project layers with a different projection into the final map projection.