LECTURE 4-B
MAP PROJECTIONS

CEEN 4800/6965 - Special Topics
Geographic Information Systems and Hydrologic & Hydraulic Modeling
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OUTLINE

- **Chapter 13**
  - **Scale and Resolution**
  - **Definition**
  - **Types**
  - **Projections in ArcMap**
  - **Exercises 13a and 13b (optional)**

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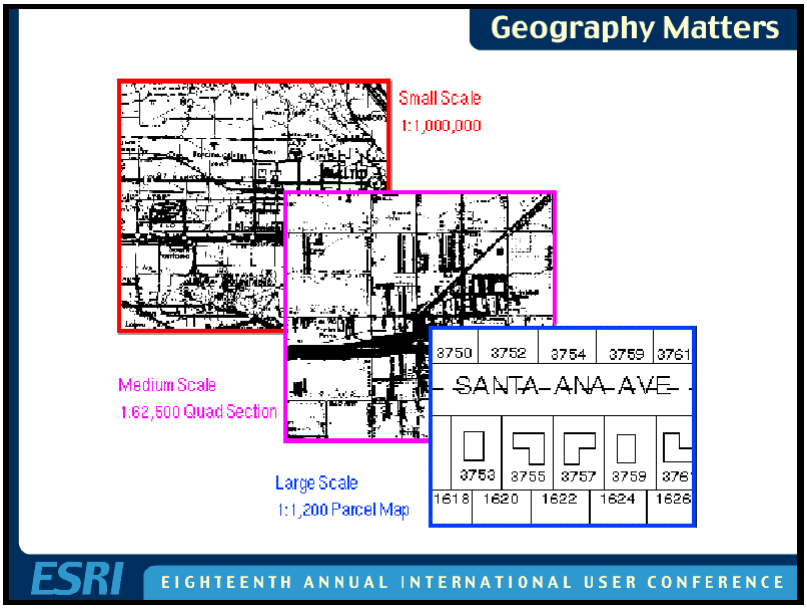
MAP SCALE



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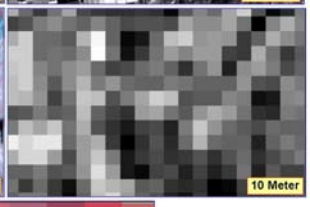
MAP RESOLUTION

0.15 m B&W orthophoto (1993)

0.60 m B&W orthophoto (1998)

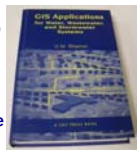
1 m color infrared orthophoto (1999)



10 m SPOT satellite imagery

30 m Landsat TM satellite imagery (2000)

Ref.: U.M. Shamsi, GIS Applications for Water, Wastewater, and Stormwater Systems (The Blue Book), Chapter 3



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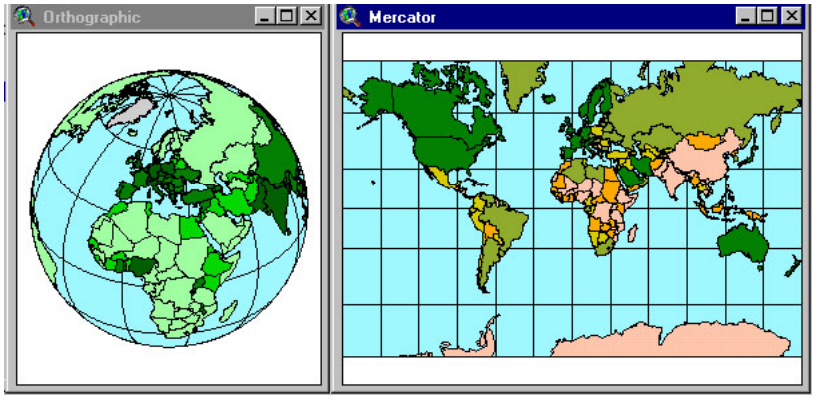
MAP PROJECTION

- Locations on the globe are measured in degrees of latitude and longitude (Geographic or Spherical)
- Locations on a map are measured using x and y coordinates (Planar)



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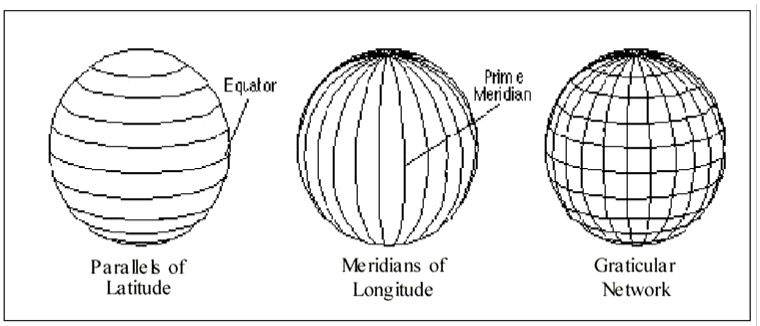
MAP PROJECTION

- A map projection is a mathematical formula which converts locations from spherical to planar coordinates
- A map is unprojected if coordinates are in decimal degrees (lat./long.)



LATITUDE AND LONGITUDE

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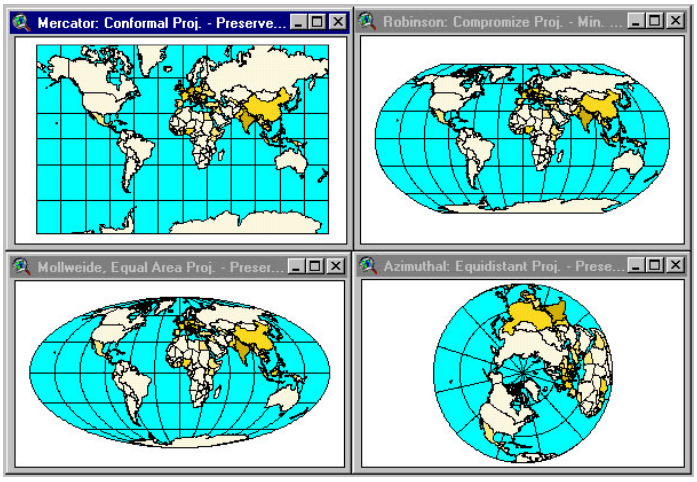
PROJECTION EXAMPLES

MERCATOR

CONFORMAL PROJECTION

PRESERVES LOCAL SHAPE



ROBINSON

COMPROMISE PROJECTION

MINIMIZES DISTORTION OF SHAPE AND AREA

MOLLWEIDE

EQUAL AREA PROJECTION

PRESERVES AREA

AZIMUTHAL

EQUIDISTANT PROJECTION

PRESERVES DISTANCE AND DIRECTION

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MAP PROJECTION IS NEEDED WHEN ...

- using measurements to make important decisions
- comparing the shape, area, distance, or direction of map features
- aligning a feature theme with an image theme

Projection: Mercator
Distance: 3,124.67 miles

Projection: Peters
Distance: 2,452.18 miles

Otherwise, it is not necessary to project.

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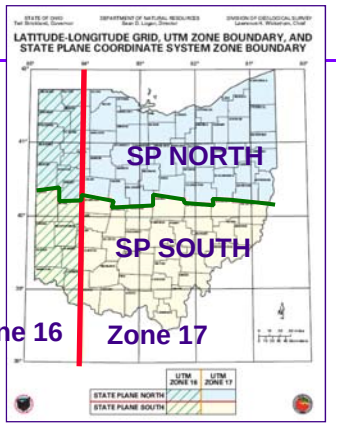
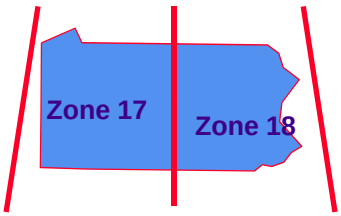
UTM PROJECTION

- UTM = Universal Transverse Mercator
- US Army 1947
- Constant N-S scale
- Variable E-W scale
- Units = metric
- USGS DRGs (topo maps)
- Two Ohio Zones:
  - Zone 16 (western 25%)
  - Zone 17 (rest of the state)





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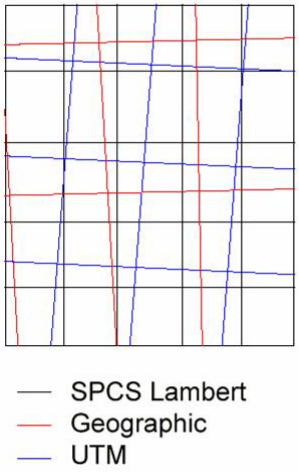
STATE PLANE COORDINATE SYSTEM (SPCS)

- Projection:
  - If state has major N-S orientation: Mercator
  - If state has major E-W orientation: Lambert
- Units = feet
- Most common in city and county GIS
- Two OH and PA Zones:
  - Ohio North
  - Ohio South



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STORING PROJECTION INFORMATION

- Many spatial data formats store the projection details along with the data
  - Shapefiles: PRJ file (*.prj)
  - CAD files: World file (*.wor)
  - Images: AUX file (*.aux)
  - Geodatabases: RDBMS table

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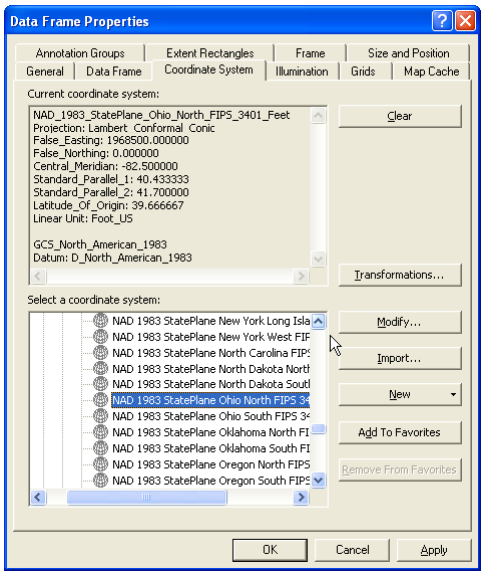
PROJECTIONS IN ARCMAP

- Many supported projections
- Predefined projection files
- Projections are defined for a data frame from the "Coordinate System" tab of the Data Frame Properties window



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VIEWING PROJECTION INFORMATION

- **Check your data's projection information**
  - **In the Spatial tab in the metadata, or**
  - **Open the feature class properties in ArcCatalog.**

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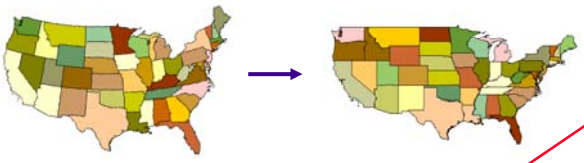
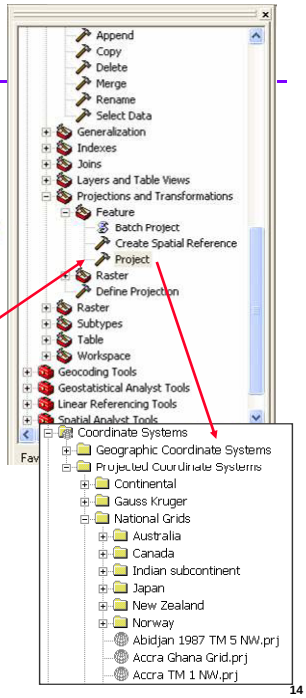
Changing projections

- **Change the way features (or coordinates) are projected**



- **Use Project tool in ArcToolbox Data Management tools**
  - **Input projection must be defined**
  - **Select from predefined coordinate systems**
  - **Import the coordinate system from an existing dataset**



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READING ASSIGNMENT

- **Chapter 13 Projecting Data in ArcMap Pages 331-337**
- **Might have questions in exams.**

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CLASS EXERCISES

- **Exercise 13a: Projecting Data on the Fly**
- **Exercise 13b: Defining a Projection (Optional)**

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