Georeferencing

Susan Powell, GIS & Map Librarian
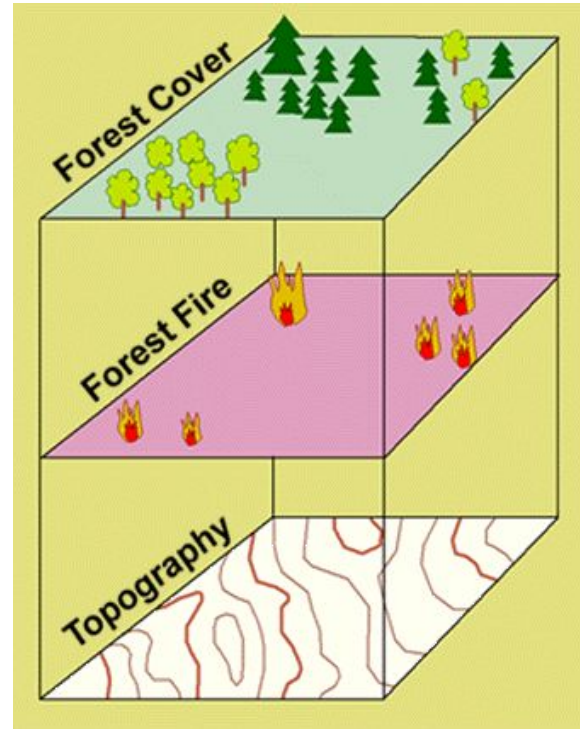
Road "map"

- Introduction to geospatial concepts

- Theory of georeferencing

- Sources for data
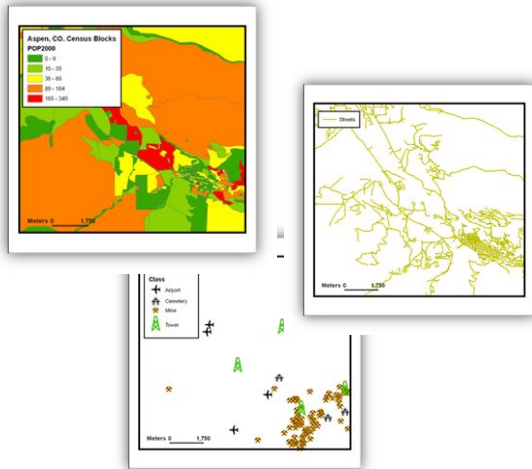
- Ready, set, georeference!

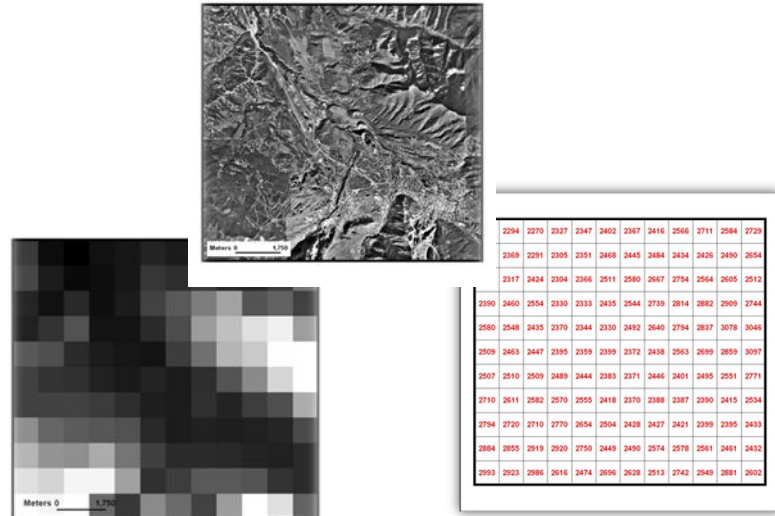# Introduction

What is GIS?

Geographic

Information

System/Science

Types of data

VECTOR

RASTER

Spatial reference system

ORANGE PEEL CONTINENTAL GOODE HOMOLOSINE

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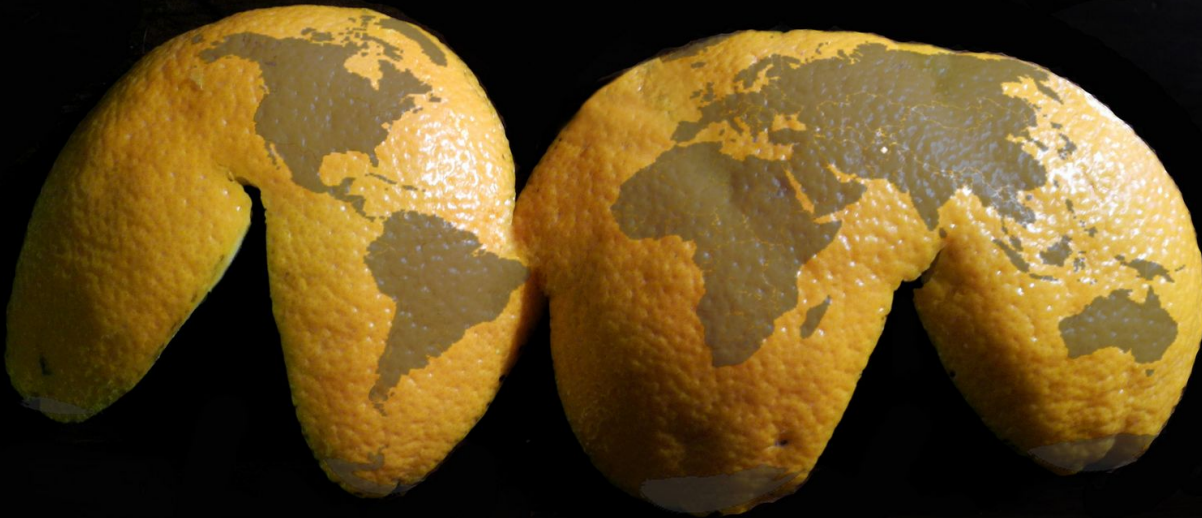
Geographic coordinate systems
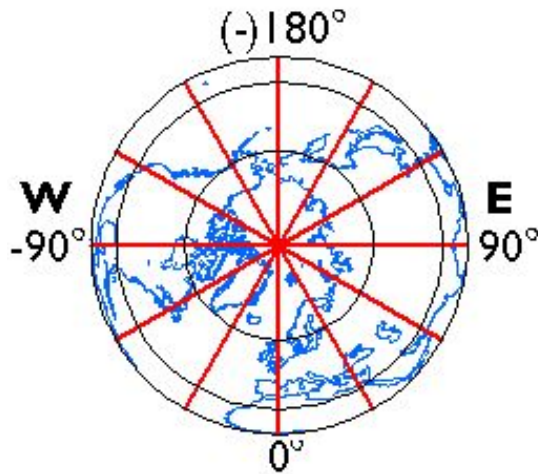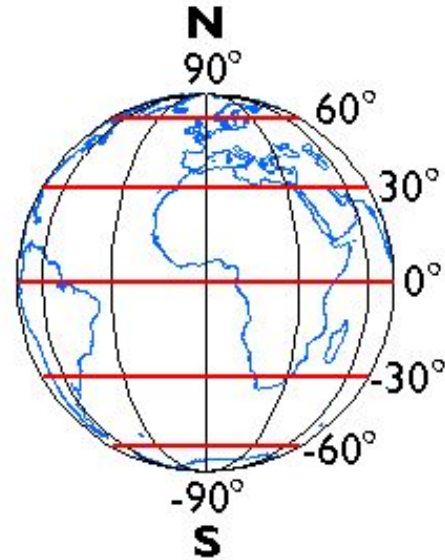
Longitude   Latitude

Projected coordinate systems

Cylindrical — Mercator
Conical — Perspective Conic
Planar — Orthographic

Projection Concepts
Perspective Examples

earth.rice.edu

Projected coordinate systems

Three Map Projections Centered at 39 N and 96 W

Mercator

Lambert Conformal Conic

Un-Projected Latitude and Longitude

Peter H. Dana 6/23/97

Geo-referencing

britishlibrary.typepad.co.uk; www.lynxgeos.com
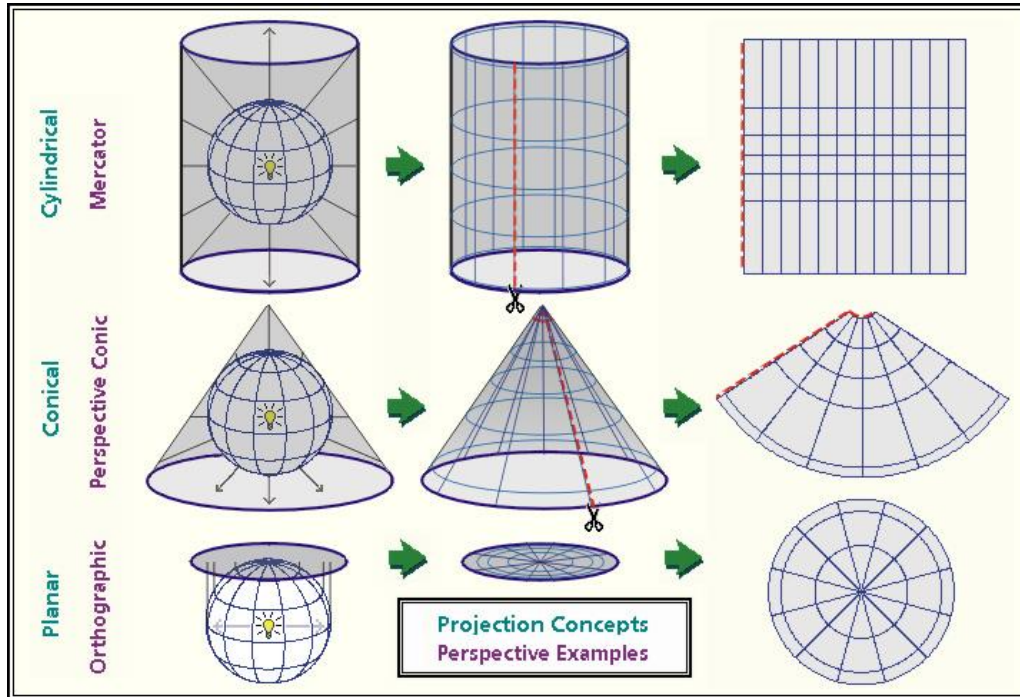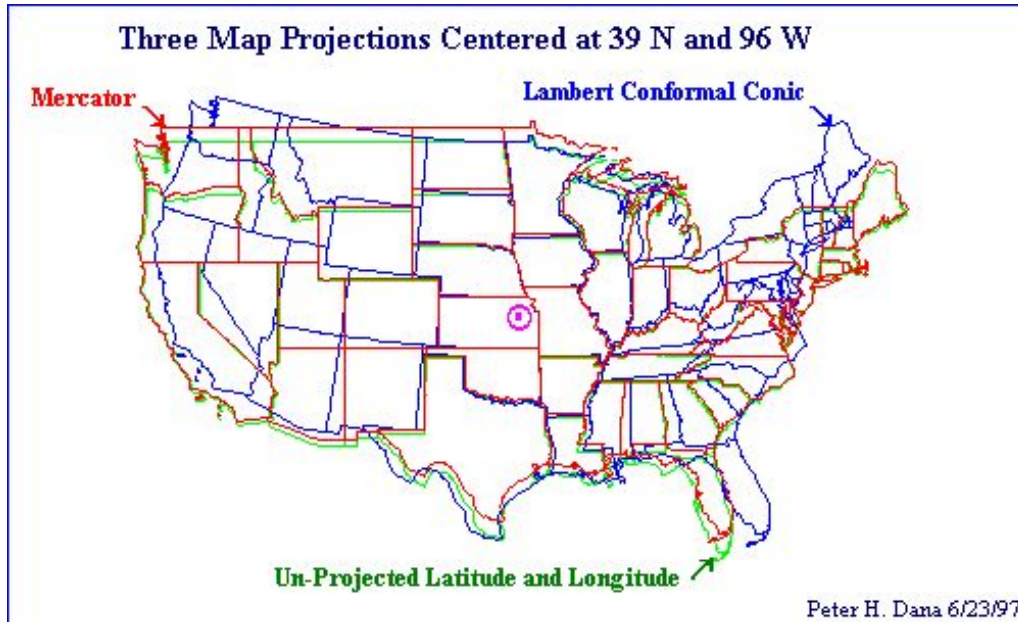
Fun examples

Photogrammar

Atlas of the Historical Geography of the US

Essential components

- GIS software program

- Spatial reference system

  Guide to projections: http://pubs.usgs.gov/pp/1453/report.pdf

- Un-referenced map or image

- Reference layer (or control points)

Sources for Scanned Maps

- David Rumsey http://www.davidrumsey.com/

- NYPL Map Warper http://maps.nypl.org/warper/

- Hipkiss' Scanned Old Maps (from books)

    - http://www.hipkiss.org/data/maps.html

- Old Maps Online (search across collections)

    - http://www.oldmapsonline.org/

For more go to: guides.lib.berkeley.edu/maps

What to look for in a map

You can geo-reference pretty much just about anything, but some work better than others!

For web-based:

   small areas or Mercator projections

Basic steps

1. Identify geospatial reference system of map

2. Load un-referenced map and reference layer

3. Create ground control points (GCPs)

    a. Drop point on map

    b. Drop corresponding point on reference layer or enter map coordinates

Considerations

Crop non-spatial parts
of scanned map

Placement of GCPs

- Look for stable, identifiable landmarks

  - Road intersections, property boundaries, buildings

    (depending on scale)

- Aim for equal distribution

- Use trial and error

Ready, Set, Georeference!

Do More!

Publish your map online.

*Digitize features.*

Georeferencing with Map Warper (browser based)

Basic steps

1. Find an image to georeference

2. Create an account with MapWarper.net &/or login

3. Upload map and add metadata

4. Rectify!

5. Export...

Georeferencing with ArcMap

Transformation types

- Polynomials
  - 1st-order (Affine): Stretch, scale, rotate
  - 2nd- & 3rd-order: Bend, curve
- Spline: Privileges GCPs
- Adjust: Optimizes for both global and local fit
- Projective: Warped lines remain straight, but no longer parallel. Good for oblique imagery.

Original data

Affine

Second order polynomial

Third order polynomial

ArcMap
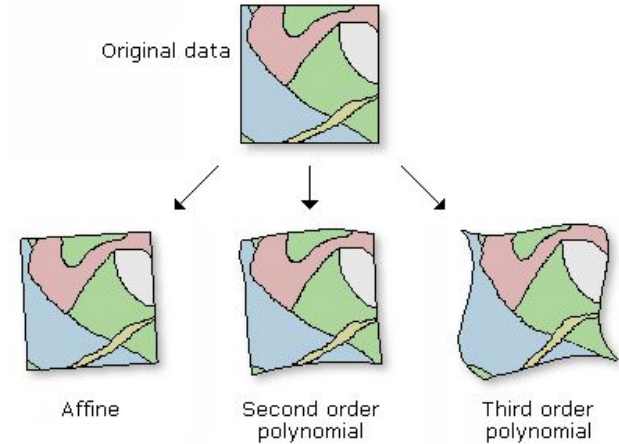
Re-sampling methods

- Nearest Neighbor
  - For discrete data
- Bilinear Interpolation
  - For continuous data, smoothing effect
- Cubic Convolution
  - For continuous data, sharpening effect

Ready, Set, Georeference!

Download materials for

"Georeferencing with ArcMap" from:

guides.lib.berkeley.edu/gis/training

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Please contact me if you have questions or would like to set up an appointment.