

# GIS 101

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# What is GIS?

- A geographic information system (GIS) integrates hardware, software, and data for capturing, managing, analyzing, and displaying all forms of geographically referenced information. -ESRI

# Three ways to look at GIS:

- Geographically referenced (*spatially enabled*) **database** that contains information (attributes) about **features** on the map
- Information from the database is displayed graphically as a **map** where symbols depict **features** correctly located on the earth's surface
- **Geo-processing and modeling tools** that allow complex analysis and data transformation (e.g., derived datasets)

# Why not CADD?

- Computer Aided Drafting and Design (CADD) is a technical drawing program
- Data is not geographically referenced in a *spatially enabled database*

# Features in GIS

- Locations of schools, boat launches, armories, fire stations, cities, water quality monitoring sites are represented by *points*
- Locations of road centerlines, railroad tracks, sewage lines, telephone lines, electric transmission lines, contour elevations are represented by *lines*
- Locations of lakes, town boundaries, county boundaries, habitat boundaries, eelgrass beds, Senate districts are represented by *polygons*

# Points, Lines, Polygons = Vector

- *Vector data* represent **discrete** features:
  - a school is located at a distinct location (point) on the earth
  - a road centerline or rail line is located along a particular path on the earth (line = infinite string of points)
  - the boundary for a town or county constitutes a distinct polygon if drawn on the earth's surface (polygon = connected set of lines that enclose an area)

# So what's Raster data?

- Data composed of *pixels*; *grid cells* in a matrix. Usually has minimal attribution (e.g., color value)

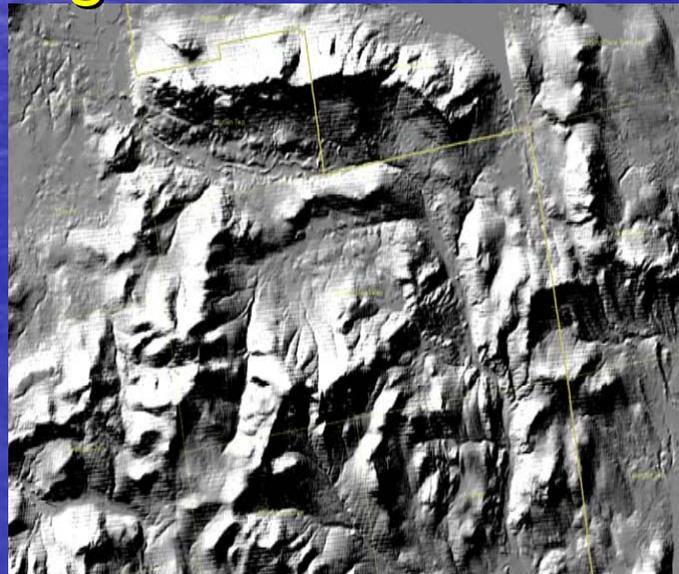
Orthoimagery



# Raster data (cont'd)

- DEMs: created from contour elevation (vector) data; involves interpolating between known data (elevation) values—this one also uses a hill shading effect

## Digital Elevation Models



# Raster data (cont'd)

- Digital Raster Graphic (drg): scanned, geo-referenced USGS topo maps

## Digital Raster Graphics

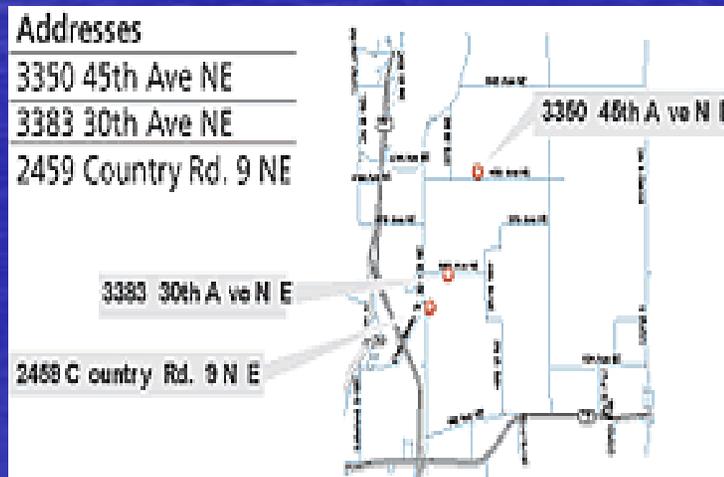


# Data Layers in GIS



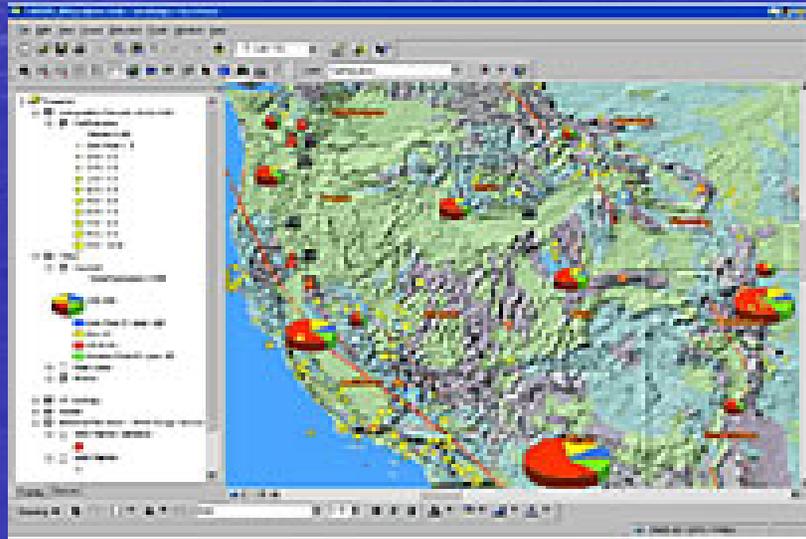
# What can GIS do?

- GIS is a graphical interface driven by *database* technology that consumes *spatially enabled data* – data that include location attributes. As such, it allows the user to capture, organize, analyze, display, store and maintain data.



# What can GIS do? (cont'd)

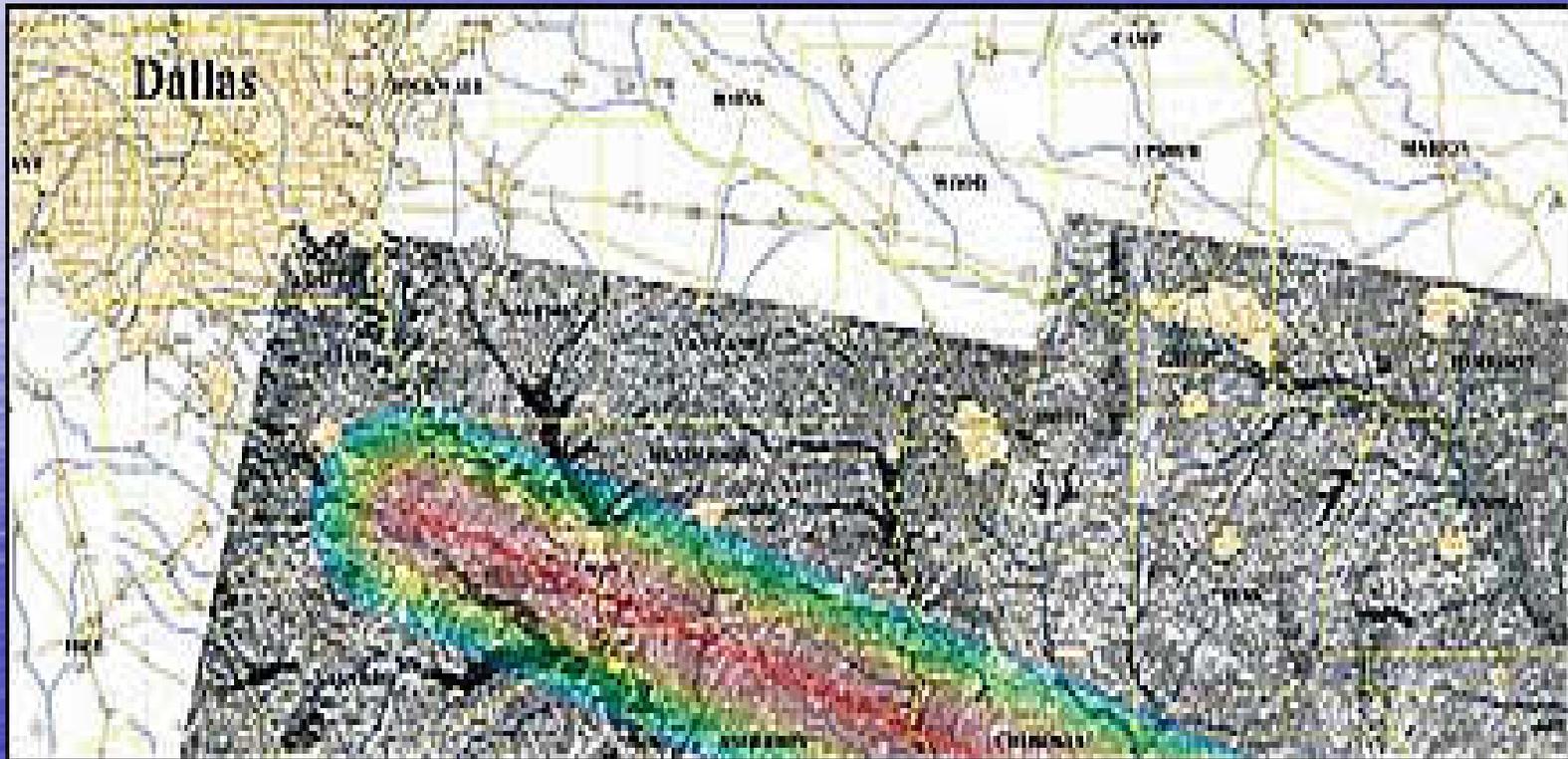
- *Map* features from the database and show relationships between features on the earth's surface;
- provides user the ***ability to query*** the database, perform analyses, and edit data



# What can GIS do? (cont'd)

- Provides user *geo-processing tools* that take information from existing databases and derive new datasets;
- allows the creation of *models*, for instance a predictive model that mapped the *anticipated distribution of debris from the Space Shuttle Columbia over eastern Texas* in February 2003

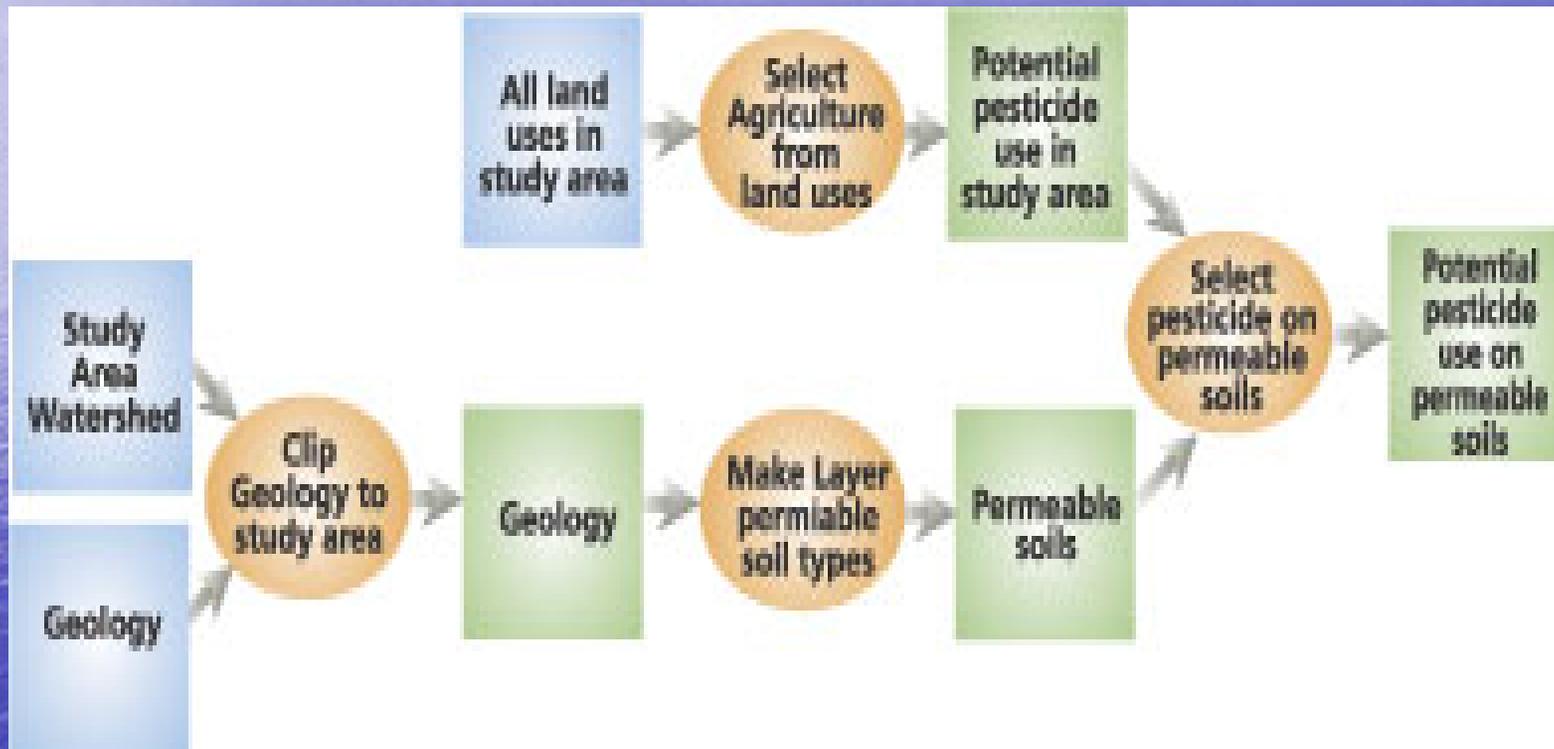
# What can GIS do? (cont'd)



## What can GIS do? (cont'd)

- Or a *process or workflow model identifying potential pesticide use on permeable soils within a given watershed* based on a query of the Geology layer that yields a permeable soils layer, and overlaying that permeable soils layer with a layer depicting agricultural land use derived from the land use layer and clipped to the watershed of interest

# What can GIS do? (cont'd)



# Some examples of GIS at work:

- Relatives visiting the Sebago Lake area with a teen who uses a wheelchair
  - they want to know about ADA-compliant boat launches in the area
  - they want to look at colleges while they're visiting
  - they are staying at a camp and want to know the location of nearby public schools and libraries for wireless Internet access
  - they'd like to have an idea of whether they will be able to get a cellular signal from the camp (there's no landline phone at the cottage)

# Some examples of GIS at work:

- A train carrying hazardous materials has derailed close to a stream and lake, which also happen to be close to the town and county boundaries
  - Need to quickly ascertain the locations of the closest fire stations to dispatch and hospitals to notify
  - Need to set up a buffer around the location of the spill so road(s) can be closed
  - Need to look at the terrain to get some idea where any solid or liquid material might tend to move

# GIS 101

- Some free GIS services:
  - GoogleEarth using MEGIS Web Mapping Services and KML files
  - qGIS

# GIS 101

- Questions, please!
- Thank you for joining us this morning
  - Bridgit Kirouac, Maine Office of GIS
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  - <http://megis.maine.gov>