ArcGIS 9.2

An Introduction to Spatial Analyst for Soil Surveys

November, 2009

Goal

To be able to use datasets derived from elevation data for soil survey applications.

To provide soil scientists with tools to help view, describe, and analyze the relationship between landform/landform positions and the components found on those positions.

Outline -- Objectives

Introduction to Spatial Analyst

- Raster Data versus Vector Data
- Understanding DEMs
- Sources for DEMs

Module 1

- Enable the Spatial Analyst, SRITB Extension
- Add Spatial Analyst Toolbar to the View
- Merge DEMs
- Project DEM Data
- Clip a DEM to a Defined Area
- Calculate Elevation Values by Map Unit

Objectives, cont.

Module 2 (The Slope Gradient Model)

- Review Slope Gradient Models
- Slope Gradient - Region Group Step 1 Model
- Slope Gradient - Nibble Step 2 Model
- View & Symbolize the Slope Layer
- Intersect Slope Shapefile and Soil Layer
- Export Soil/Slope Intersect Data Table
- Summarize Slope by Map Units

Objectives, cont.

Module 3 (The Slope Curvature Model)

- Review Slope Curvature Model
- Curvature - Region Group Step 1 Model
- Curvature - Nibble Step 2 Model
- Symbolize & Evaluate Curvature Layer
- Intersect Curvature Shapefile and Soil Layer
- Export Soil/Curvature Intersect Data Table
- Summarize Curvature by Map Units

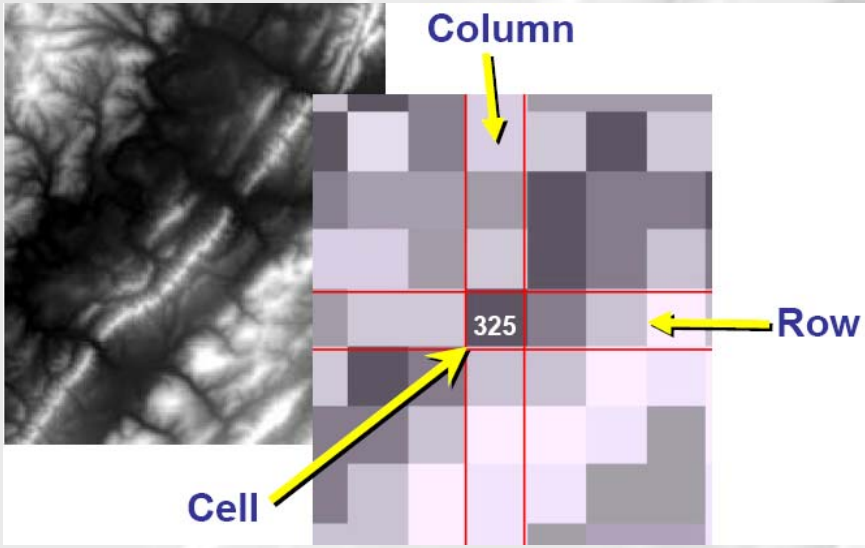
Overview of Spatial Analyst

For soil survey activities, Spatial Analyst provides a mechanism to analyze the relationship between DEMs (rasters) and Soil Polygons (vectors).

Rasters

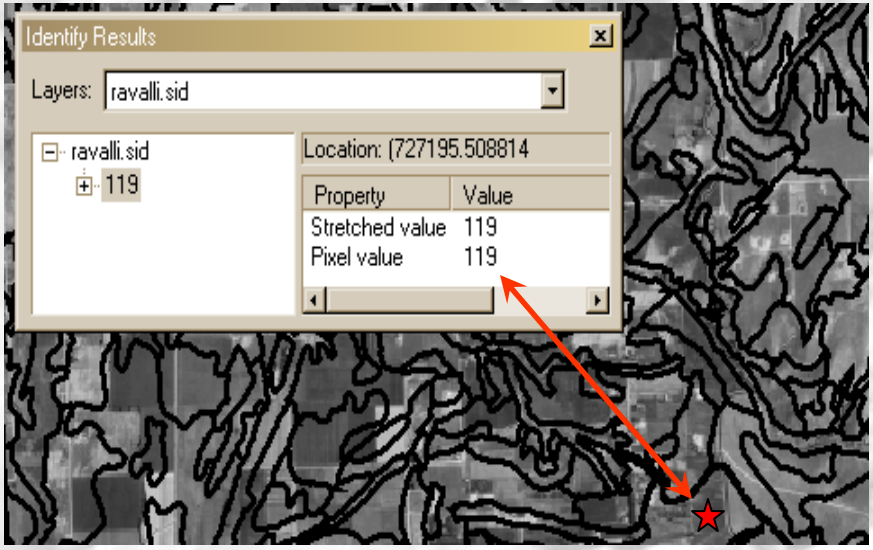
- Rasters are cells that are arranged in rows and columns.

DEM



DEMs are rasters that have a specific elevation value in each cell (cell sizes are typically 10 or 30 meters).

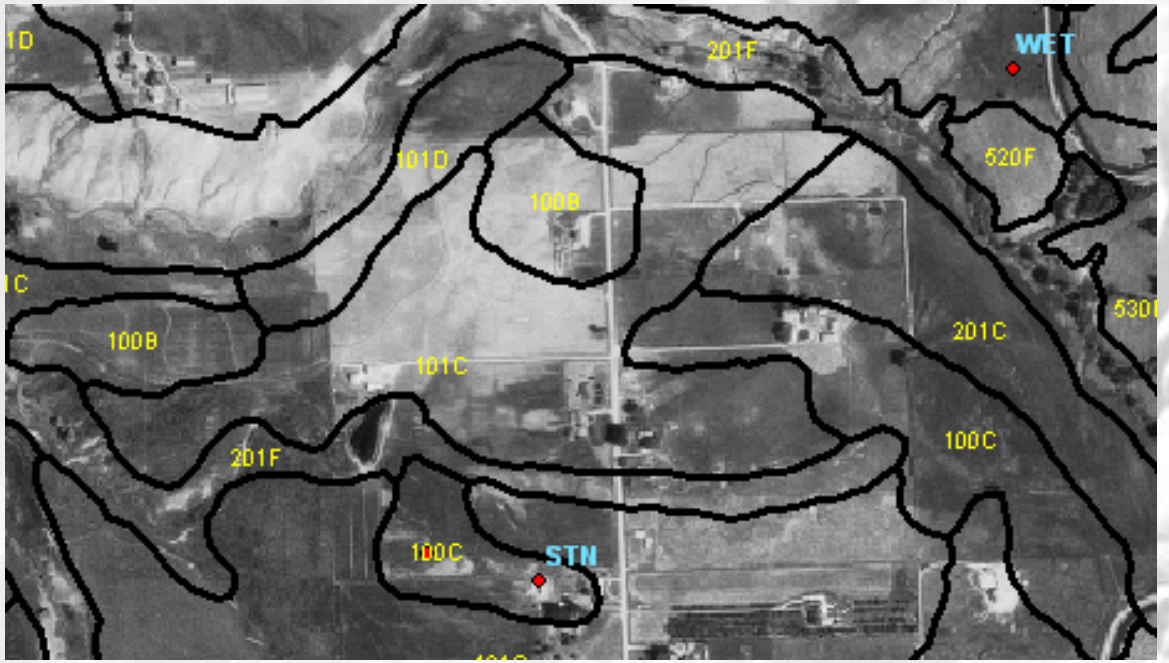
DOQ



DOQs are rasters that have a specific pixel value in each cell (cell sizes are typically 1 or 2 meters).

Vectors

- Vectors represent geographic data -- such as points, lines, and polygons.



<u>The differences between rasters and vectors</u>

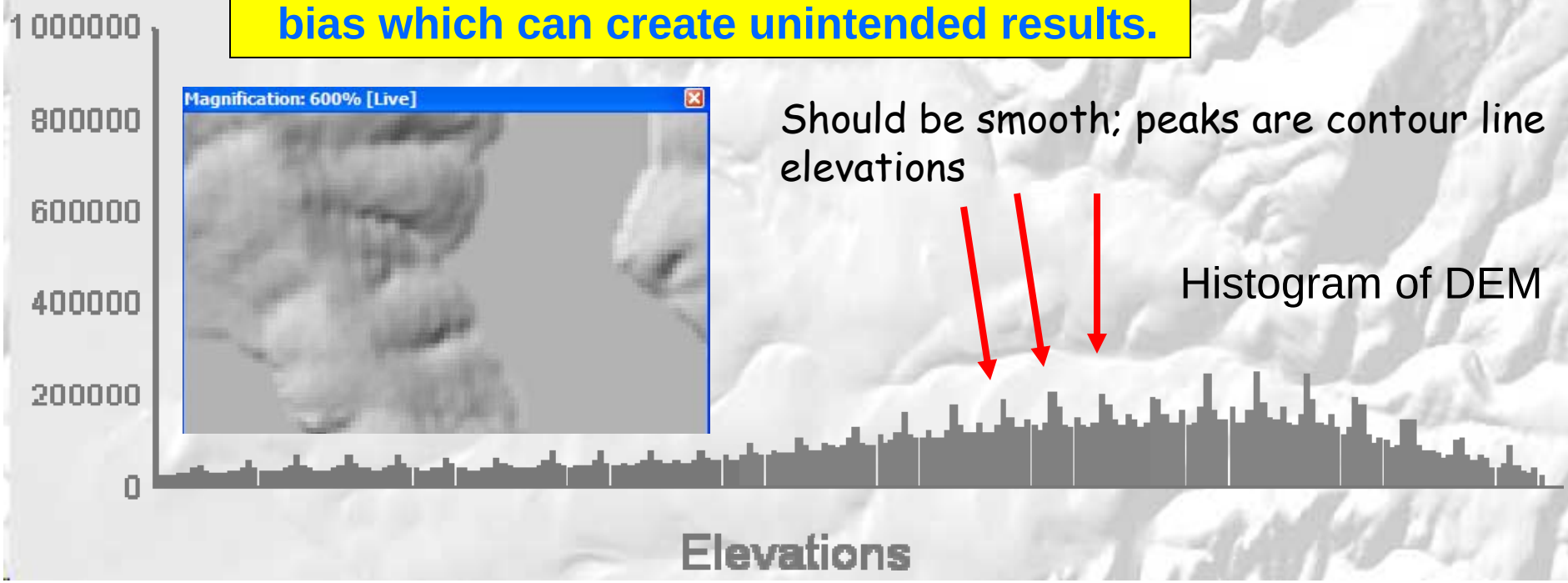
- Rasters have continuous data based on cells without defined boundaries. Each cell can have a different value.
- Vectors have defined boundaries and are uniform within the boundary.

Understanding DEMs

How are DEMs created?

- Hypsography (developed from contour lines)
  - Most DEMs are created by this method
- Photogrammetry
- Survey points from survey-grade GPS
- Satellite Imagery

Hypsography method has a contour line bias which can create unintended results.



DEM Limitations

DEMs are a useful and powerful tool, but you need to understand their limitations

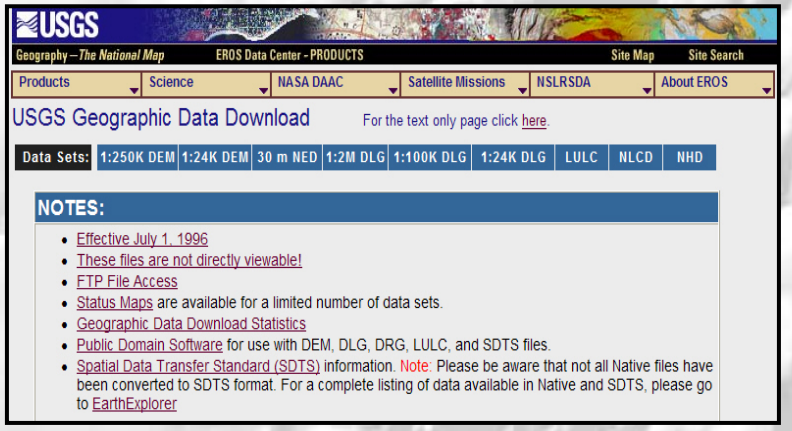
- The “M“ in DEM stands for Model
- Random errors (from misplaced contour lines)
- Contour line bias (limitation of Hypsography)
- Scale error (landform features are finer than the resolution of a DEM – example: short steep slopes)

Know the limits of your data. Check metadata about scale and resolution. Make sure 10-meter DEM data is not re-sampled 30-meter data.

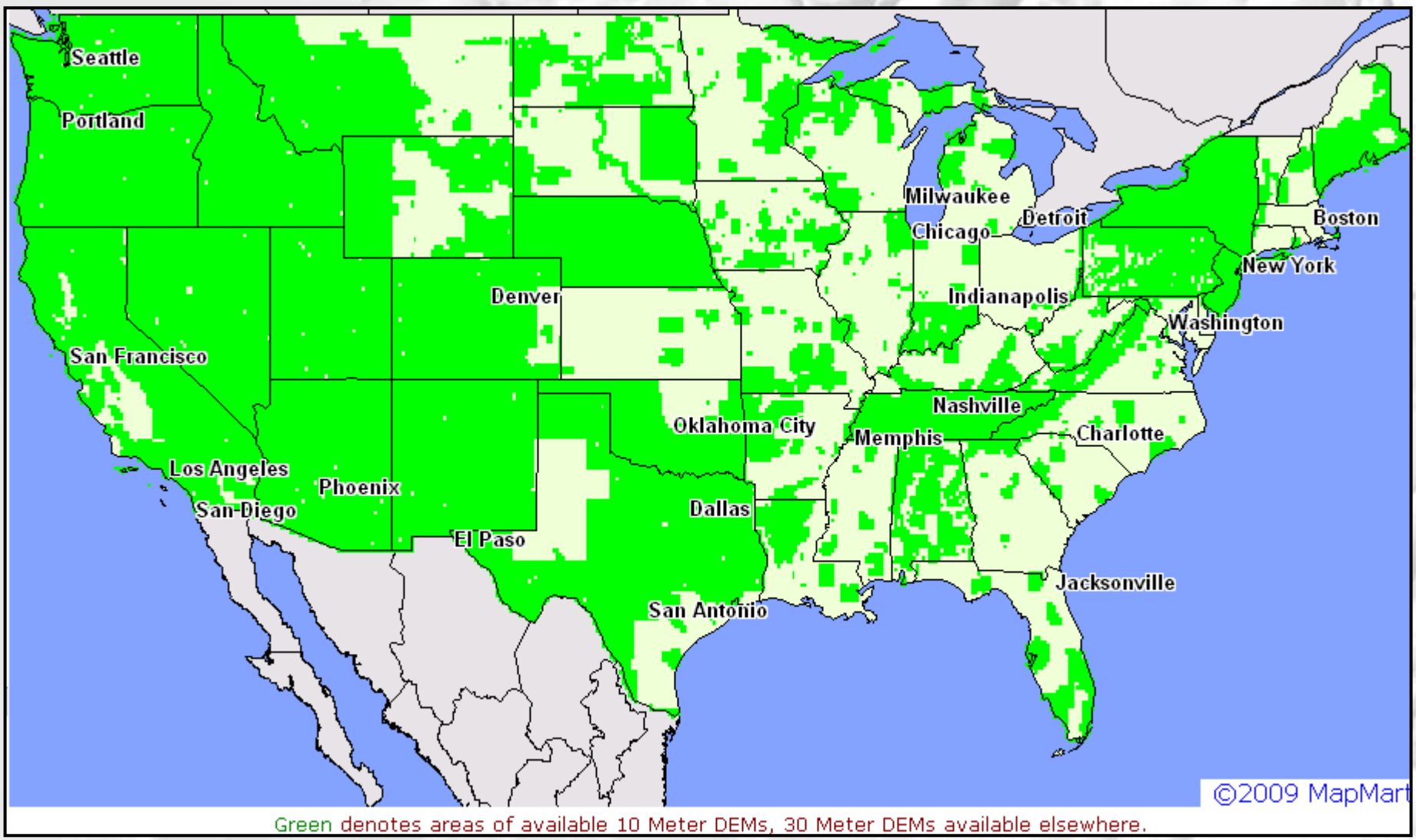
USGS Elevation Data Sources (DEMs)

National Elevation Dataset

- NEDS data (10m and 30m) is processed at NCGC for use by NRCS.
  - http://www.ncgc.nrcs.usda.gov/products/datasets/elevation/
- Projected from Geographic to UTM and available on the USDA Gateway
  - http://datagateway.nrcs.usda.gov/GatewayHome.html
- USGS Geographic Data Download from EROS:
  - http://seamless.usgs.gov/



Status Map for 10M & 30M DEMs



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