LiDAR and DEM Tips and Tricks

Tim Loesch
MNDNR

DEM/LiDAR Tips and Tricks

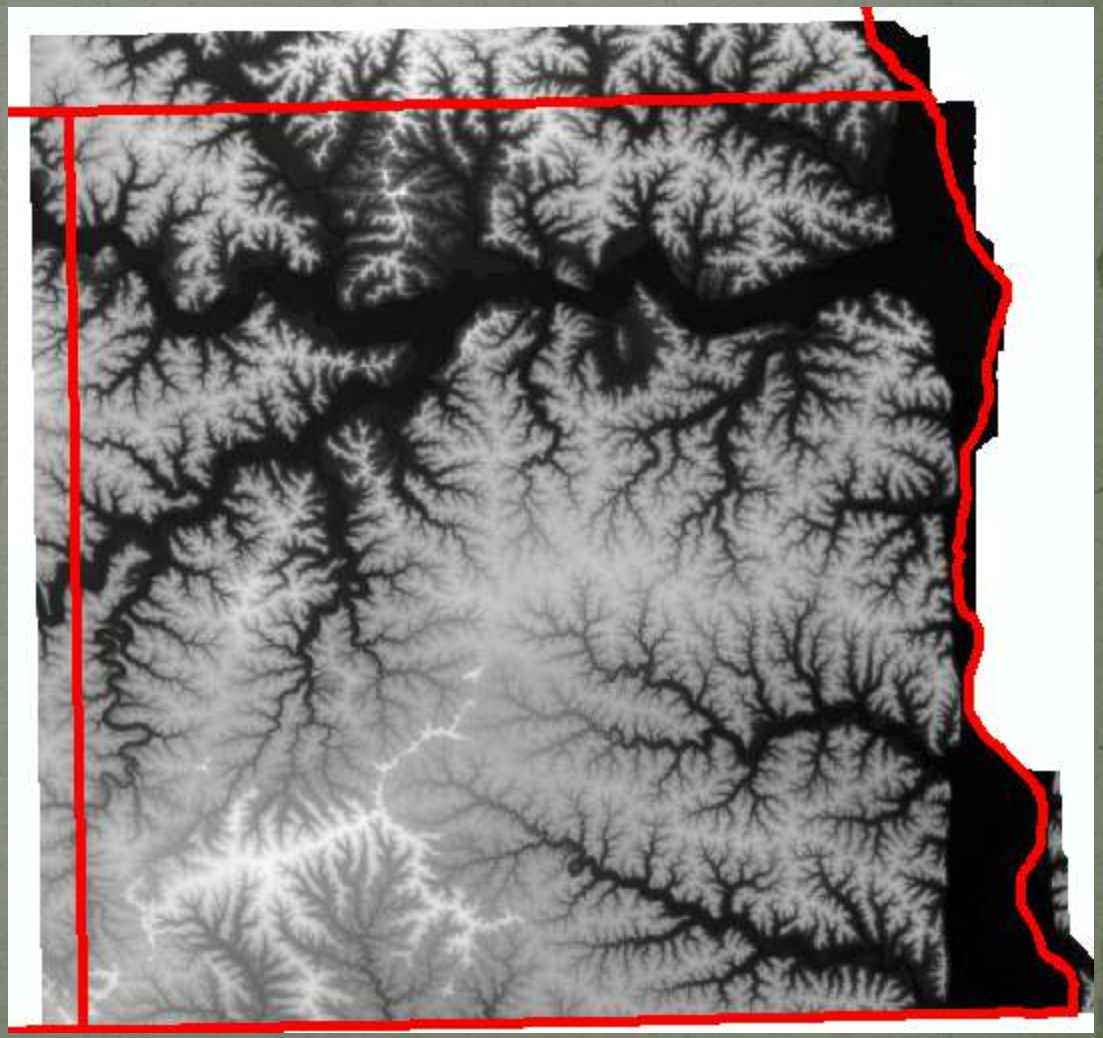
- Display techniques
  - DEM, shaded relief, color scales
- Raster Properties
  - Statistics, pyramids
- Raster Processing
  - Mosaic, Hillshade, Slope, Neighborhood, Bluffs
- DEM and LiDAR toolset
  - Convert Z-values to feet, LAS to Contour etc.

DEM/LiDAR Tips and Tricks

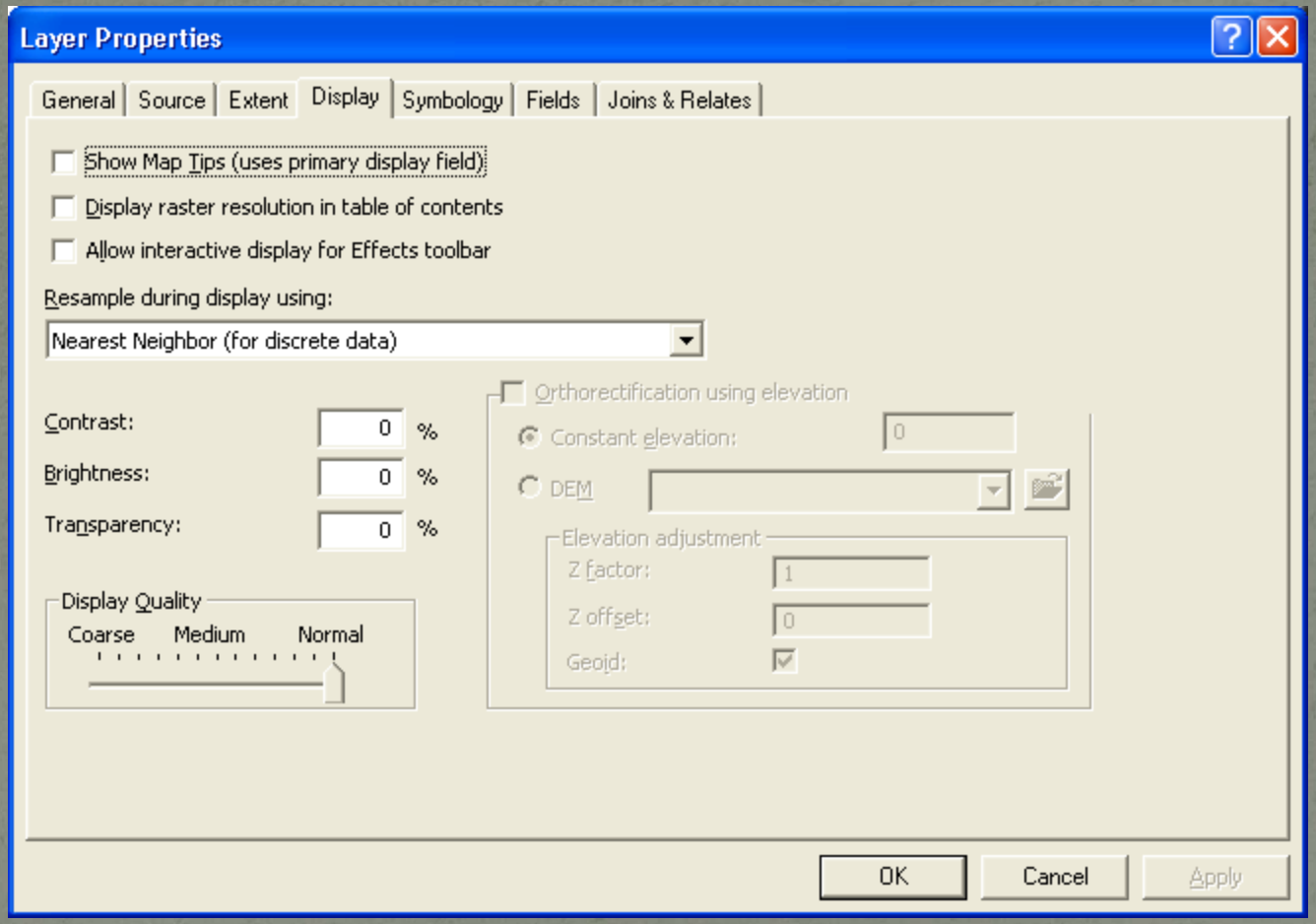
- Display tricks
  - ArcGIS Default Property Settings
    - Stretched display
      - Limits the stretches display to 2 Standard deviations
    - Statistics drive the display
      - Derived from the entire DEM
    - Predefined color ramp (usually black and white)
    - Nearest Neighbor resampling

DEM/LiDAR Tips and Tricks

- This is what you get



DEM/LiDAR Tips and Tricks

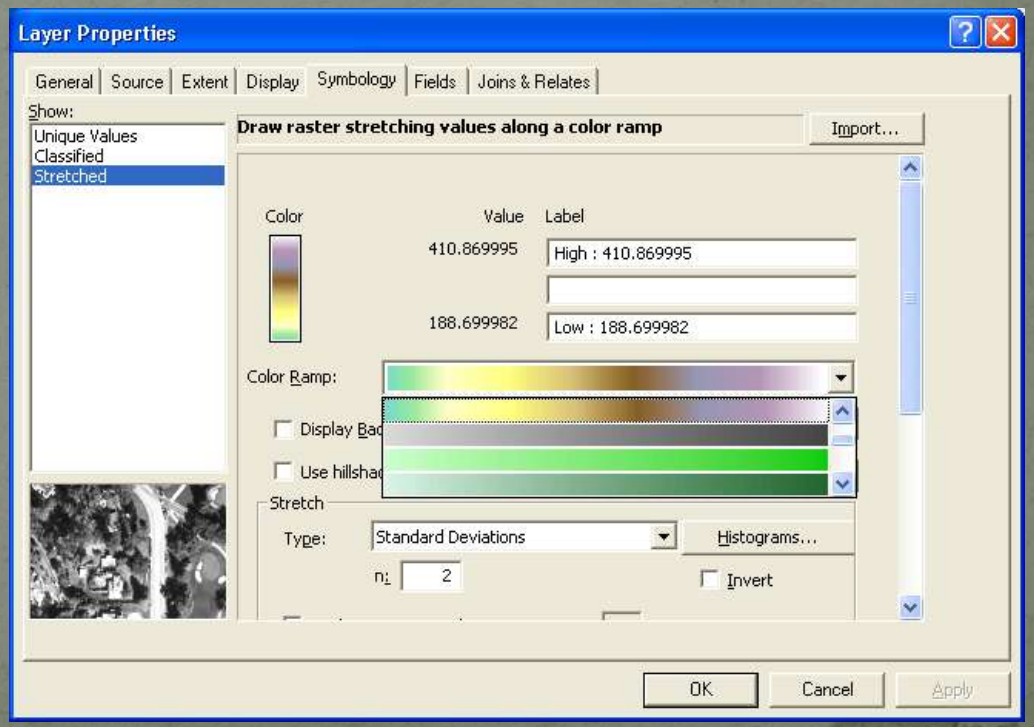


DEM/LiDAR Tips and Tricks

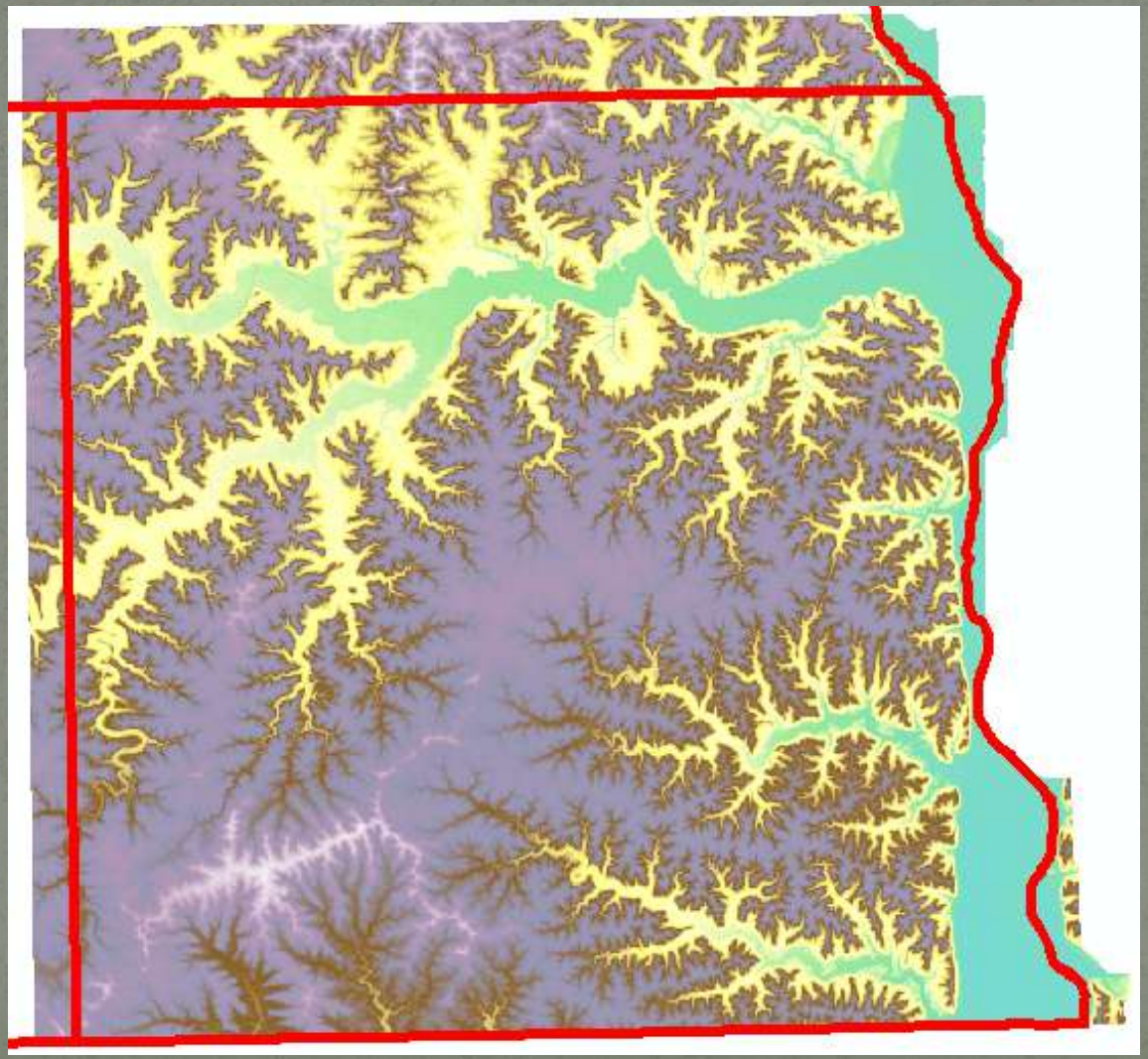
- Many ways to bring out the elevation and dress it up
  - Adding color
  - Depth and 3D look and feel
  - Smoothing cell boundaries
  - Restricting Statistics calculations
  - Varying stretch types

DEM/LiDAR Tips and Tricks

- Adding Color
  - Many color ramps to choose from
    - Monochromatic or multi-chromatic
    - Dark to light



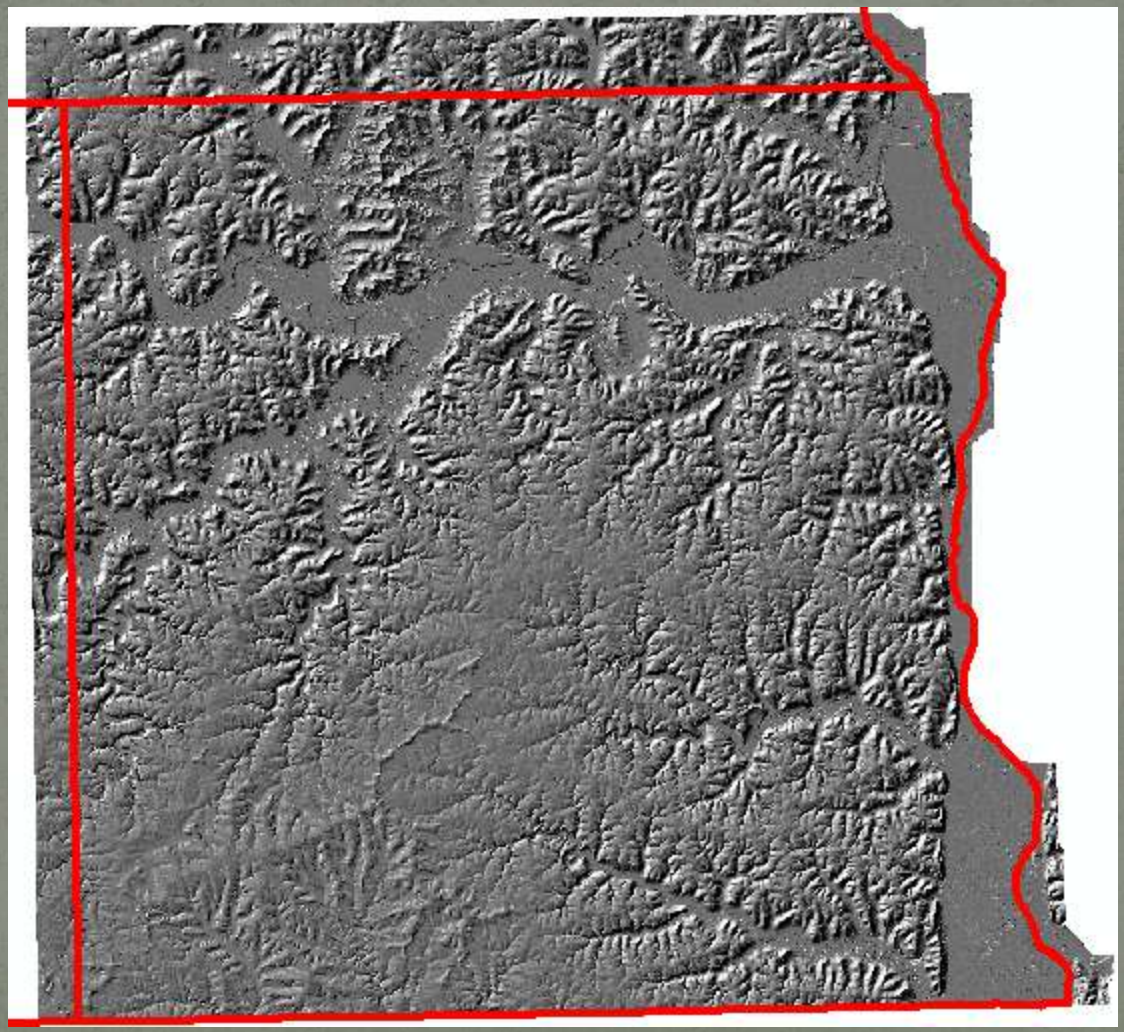
DEM/LiDAR Tips and Tricks



DEM/LiDAR Tips and Tricks

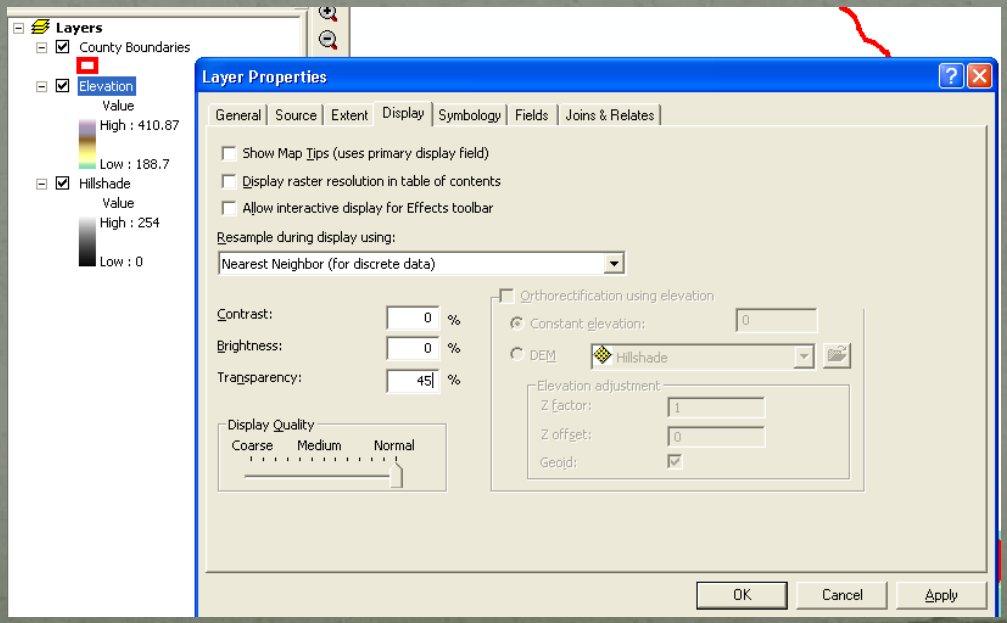
- Adding shaded relieve adds depth and perspective
  - Spatial Analyst | Surface | Hillshade
- Simulates a light surface on the landscape
  - Default values provide good results
    - Northwest at 45 degrees
  - Can add relief by varying the Z-Factor

DEM/LiDAR Tips and Tricks

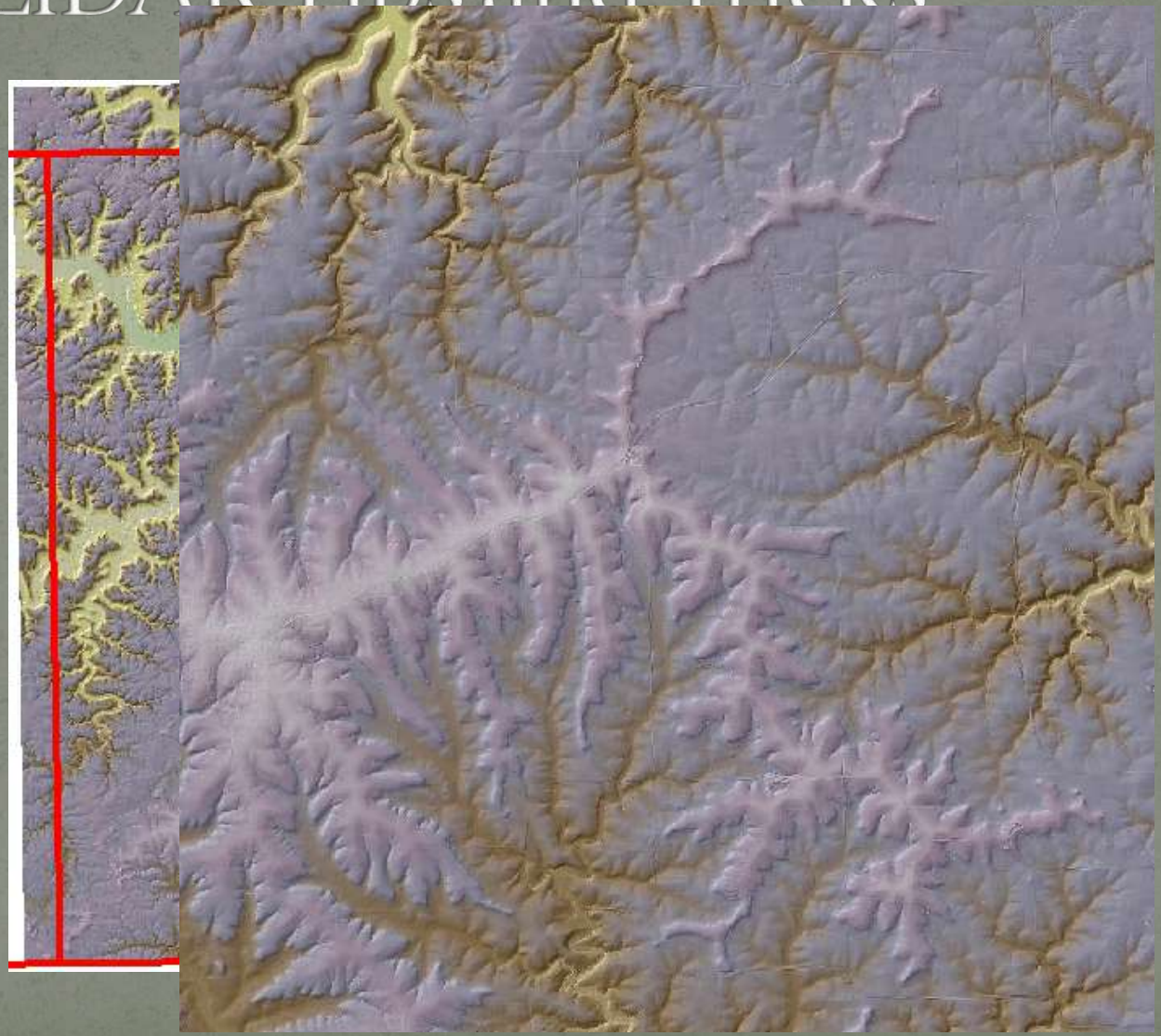


DEM/LiDAR Tips and Tricks

- Integrate elevation and hillshade for color perspective
  - Arrange Elevation on top of Hillshade in TOC
  - Make Elevation display 35-55% transparent

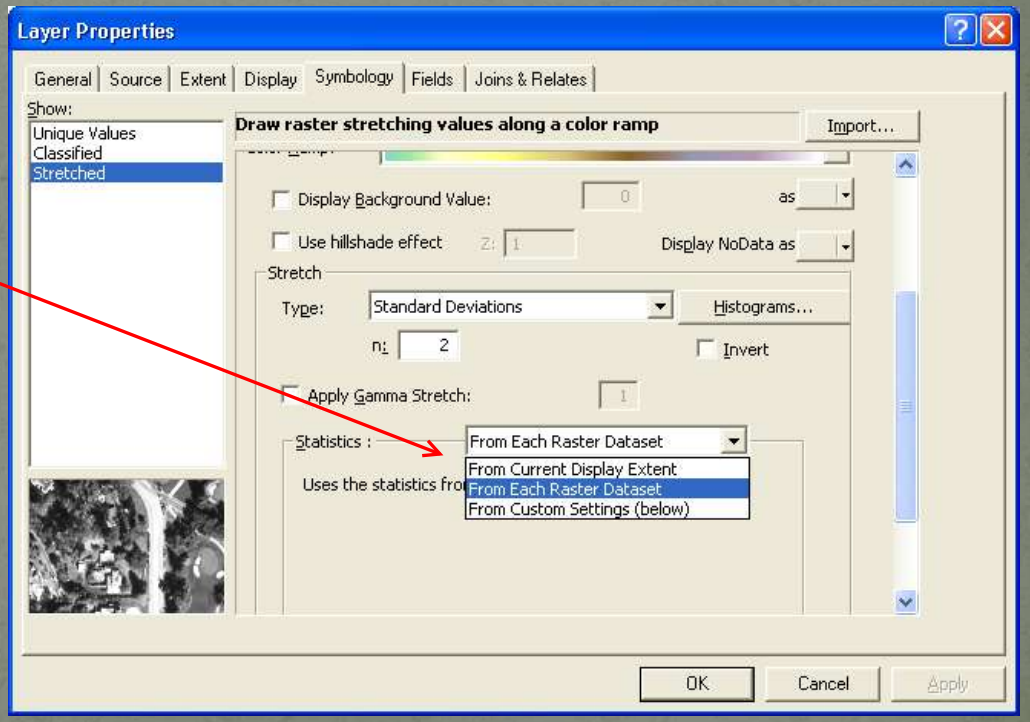


DEM/LiDAR Tips and Tricks

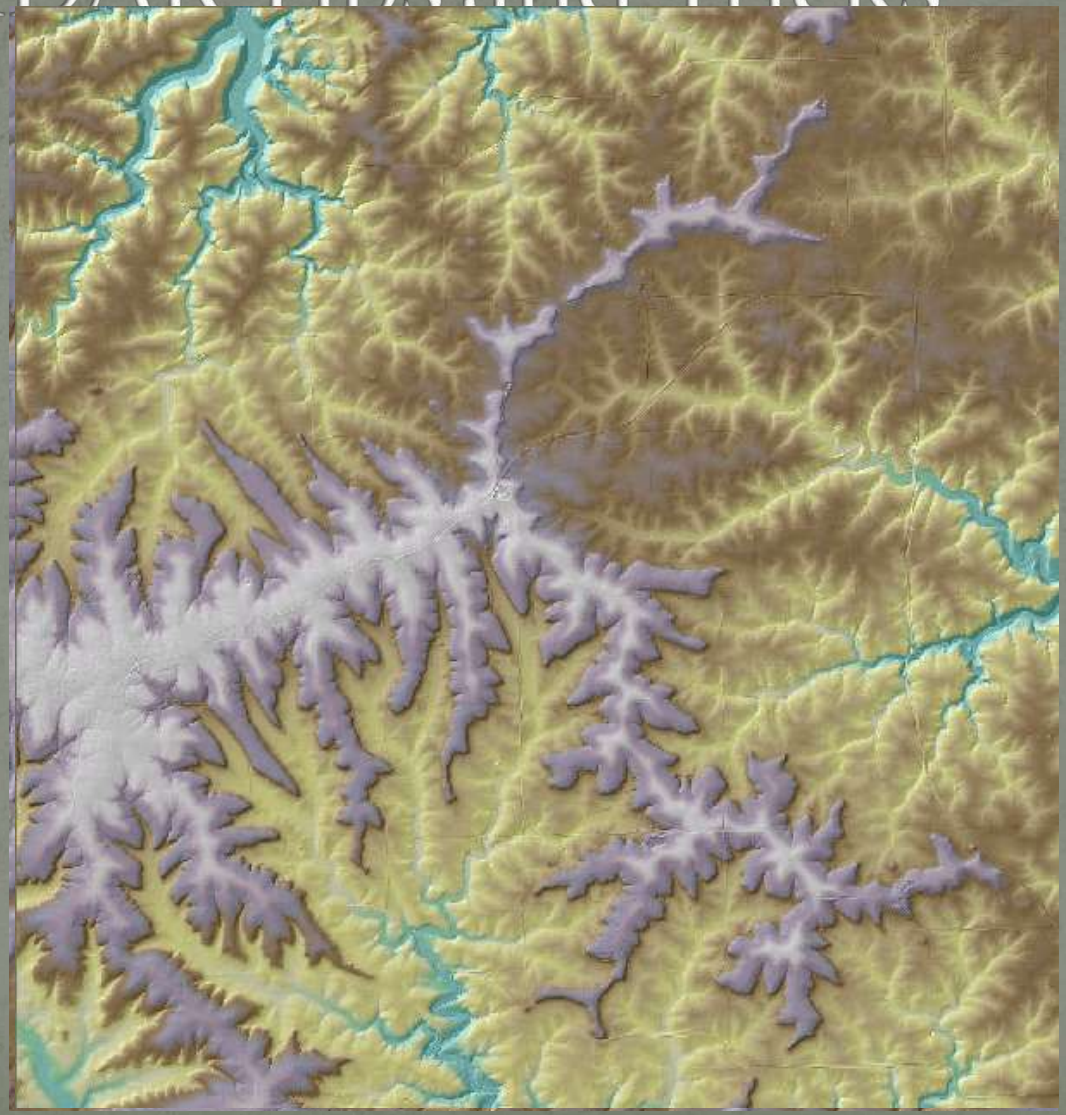


DEM/LiDAR Tips and Tricks

- But you can bring out more by controlling the way that statistics are used for the display
  - All datasets
  - Current Extent
  - Custom Settings

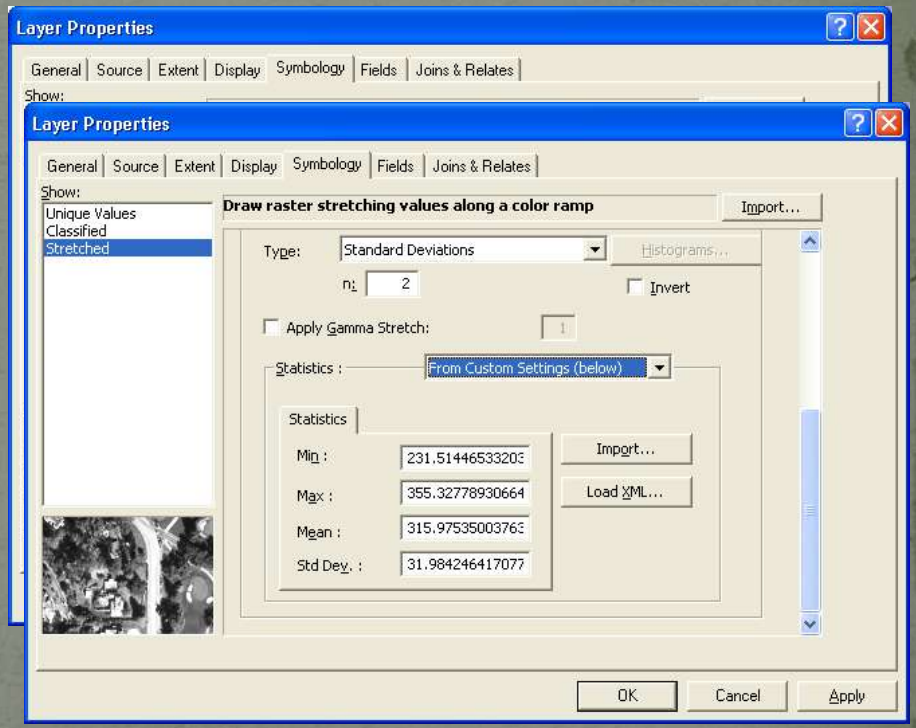


DEM/LiDAR Tips and Tricks



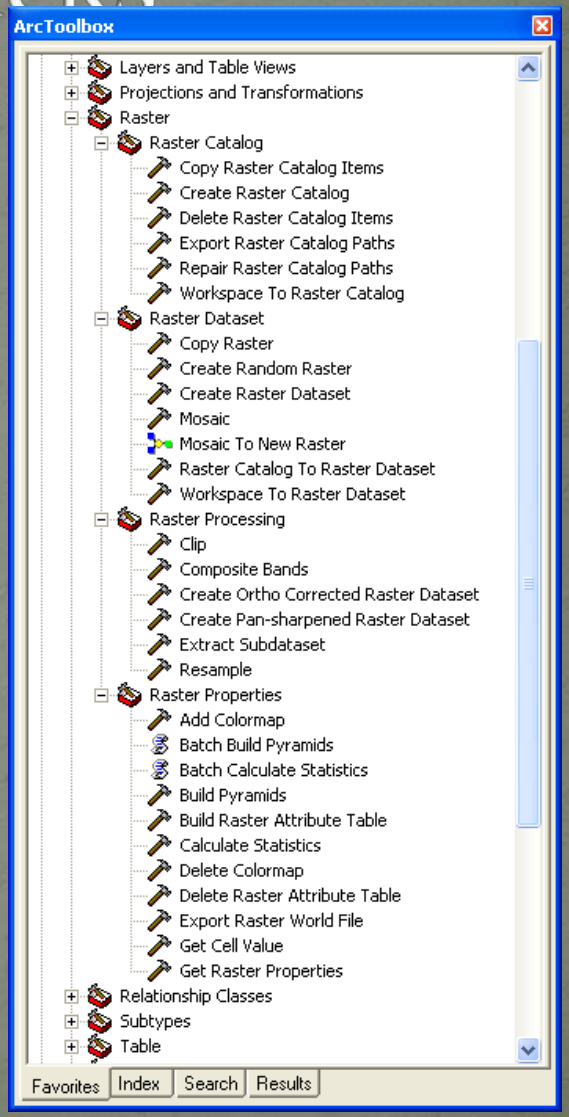
DEM/LiDAR Tips and Tricks

- Printing
  - If you use the Display Extent for Statistics
    - You'll have trouble printing
  - To resolve….
    - Save the settings as XML
    - Import Custom Settings



DEM/LiDAR Tips and Tricks

- Raster Processing –
  - ArcMAP has a number of raster tools
  - Data Management | Raster toolbox
  - Primarily for raster data management and not analysis



DEM/LiDAR Tips and Tricks

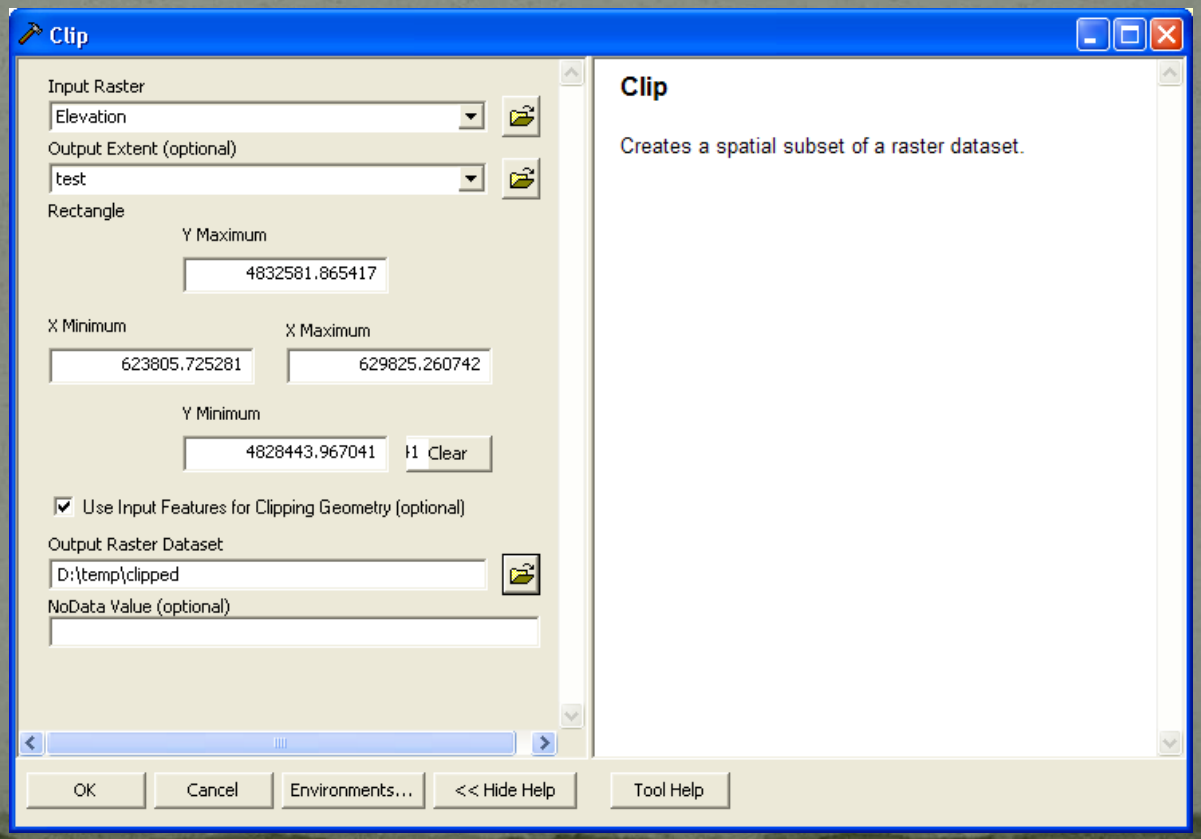
- Sometimes you receive rasters that don't have statistics already generated
  - Display parameters won't function right
  - Get a black screen where data should be
- Build Statistics using Calculate Statistics Tool
  - Raster Properties Toolset

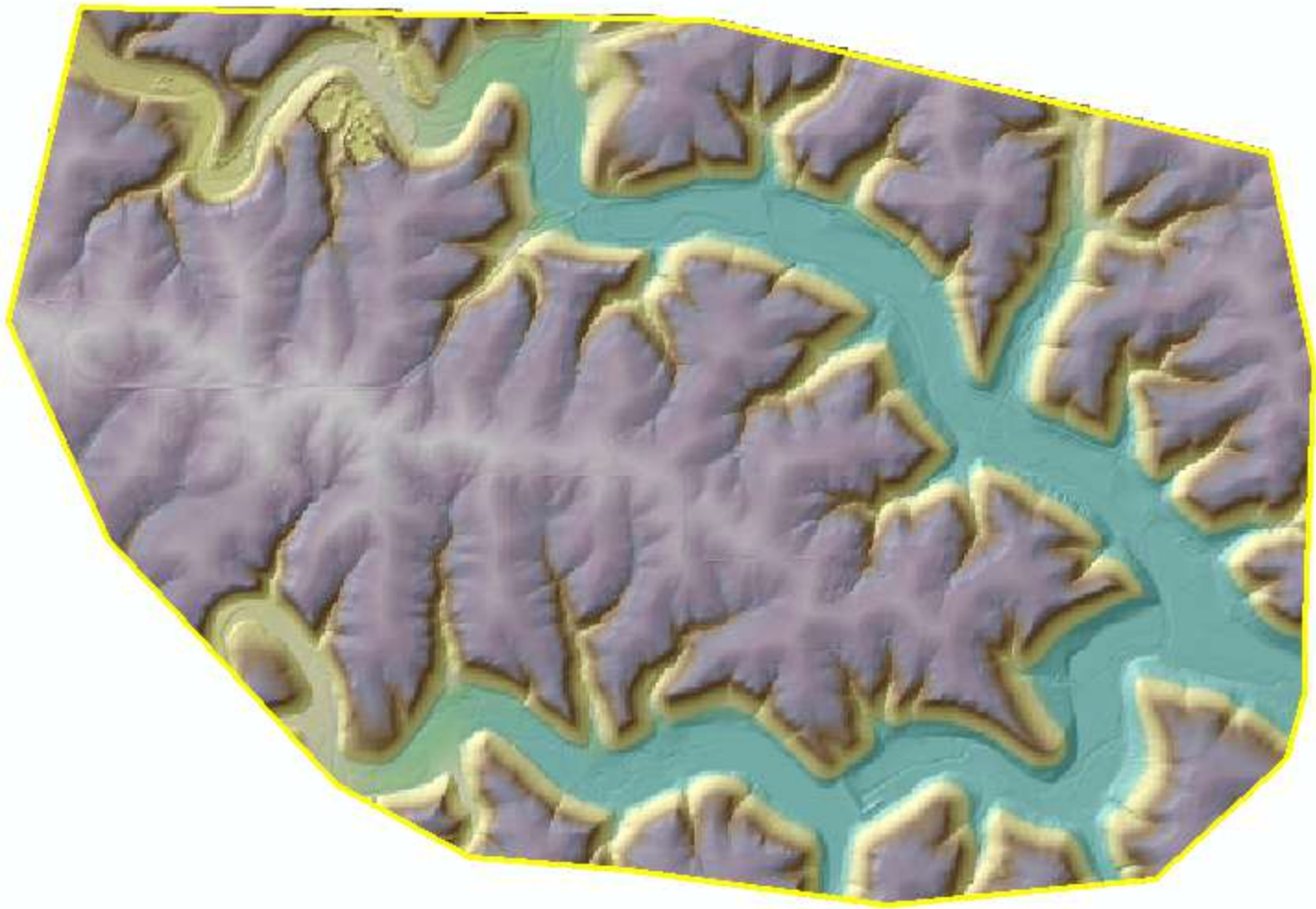
DEM/LiDAR Tips and Tricks

- Raster Pyramids
  - Are used to speed display for rasters by creating reduced resolution versions
    - Stored in a file with a .RRD extension (reduced resolution display)
  - Created by ArcMAP automatically or
  - Use the Build Pyramid Tool
    - Raster Properties Toolset

DEM/LiDAR Tips and Tricks

- Clipping Data
  - Part of Raster Processing Toolset



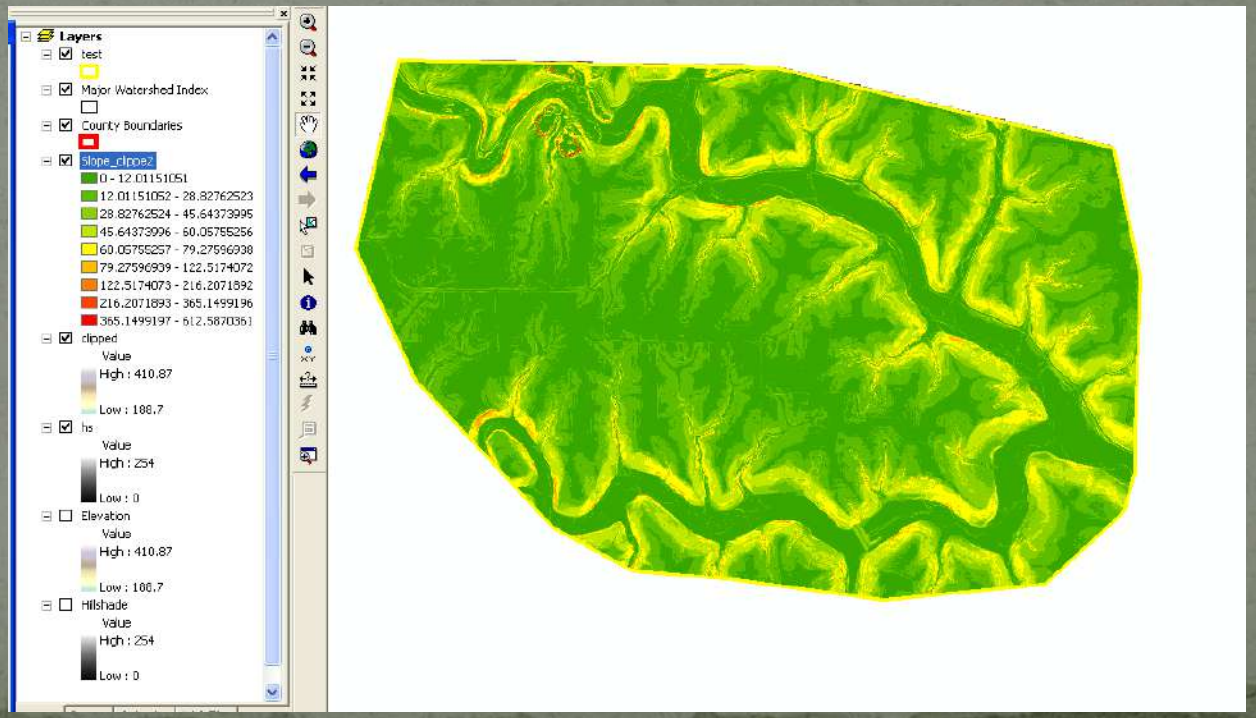


DEM/LiDAR Tips and Tricks

- Spatial Analyst Extension is required for raster Analysis
  - Hillshade, Slope, Hydro analysis, Viewsheds
  - Conditional Tools, Math and Neighborhoods
- Can be very useful for many applications
  - Raster processing is generally not well understood

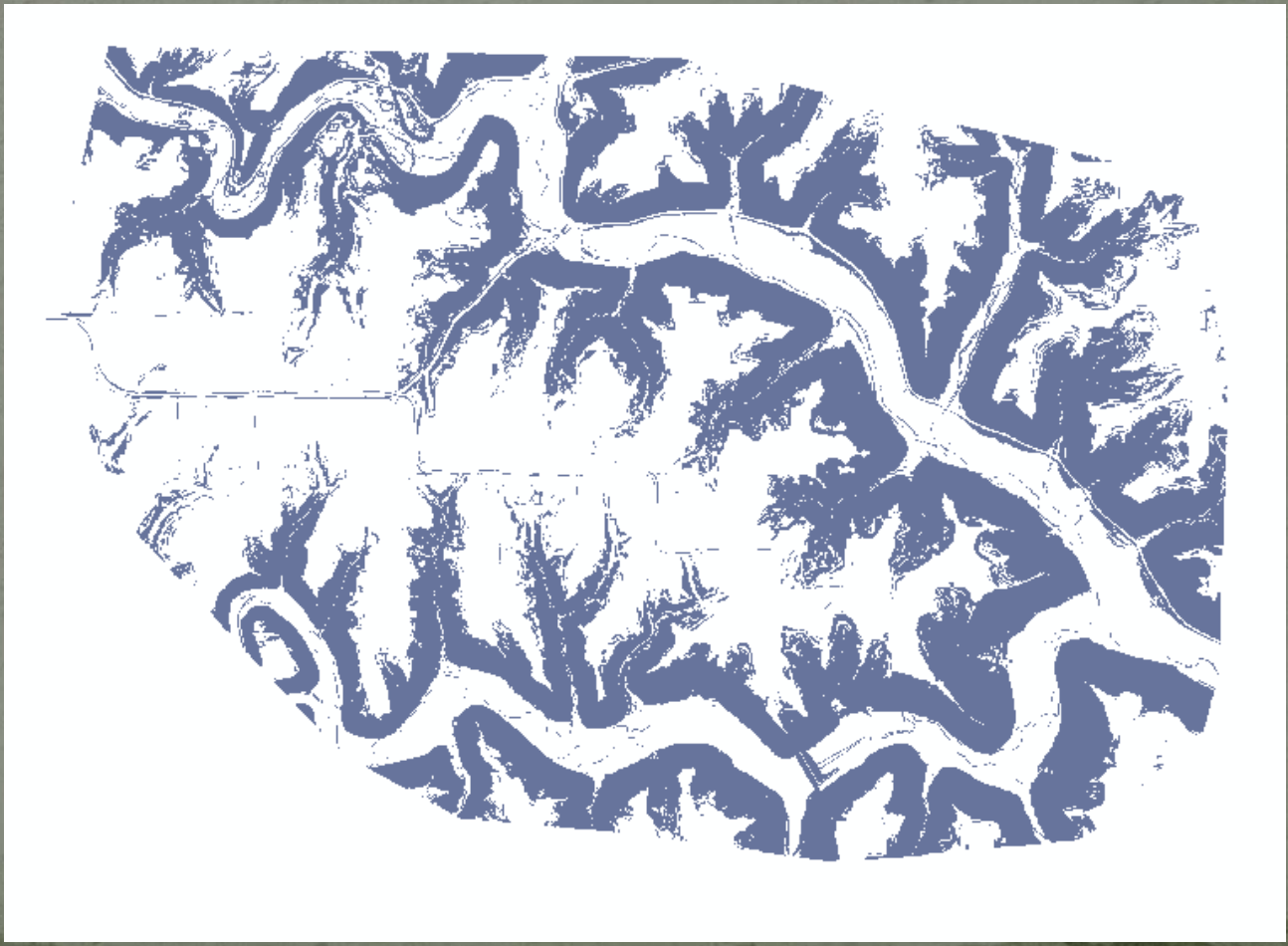
DEM/LiDAR Tips and Tricks

- Finding Bluffs
  - Areas with high slopes > 18% for example
- Create slope map



DEM/LiDAR Tips and Tricks

- Reclass to identify those areas that have high slopes



DEM/LiDAR Tips and Tricks

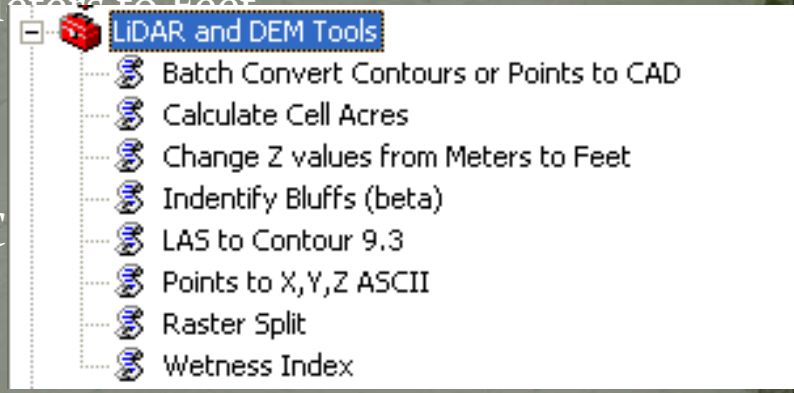
- Can do many other things
  - Cut/Fill – calculated the volume and area of cut and fill locations
  - Create Contours
  - Line of sight analysis
  - Viewshed analysis

DEM/LiDAR Tips and Tricks

- DNR Tools for DEM and LiDAR processing
  - LiDAR and DEM Tools toolbox
    - Formerly SEMN LiDAR Tools
  - Available for free at
    - ftp://ftp.dnr.state.mn.us/pub/gisftp/lidar/demtools.zip
  - A growing set of tools based on user input and demand

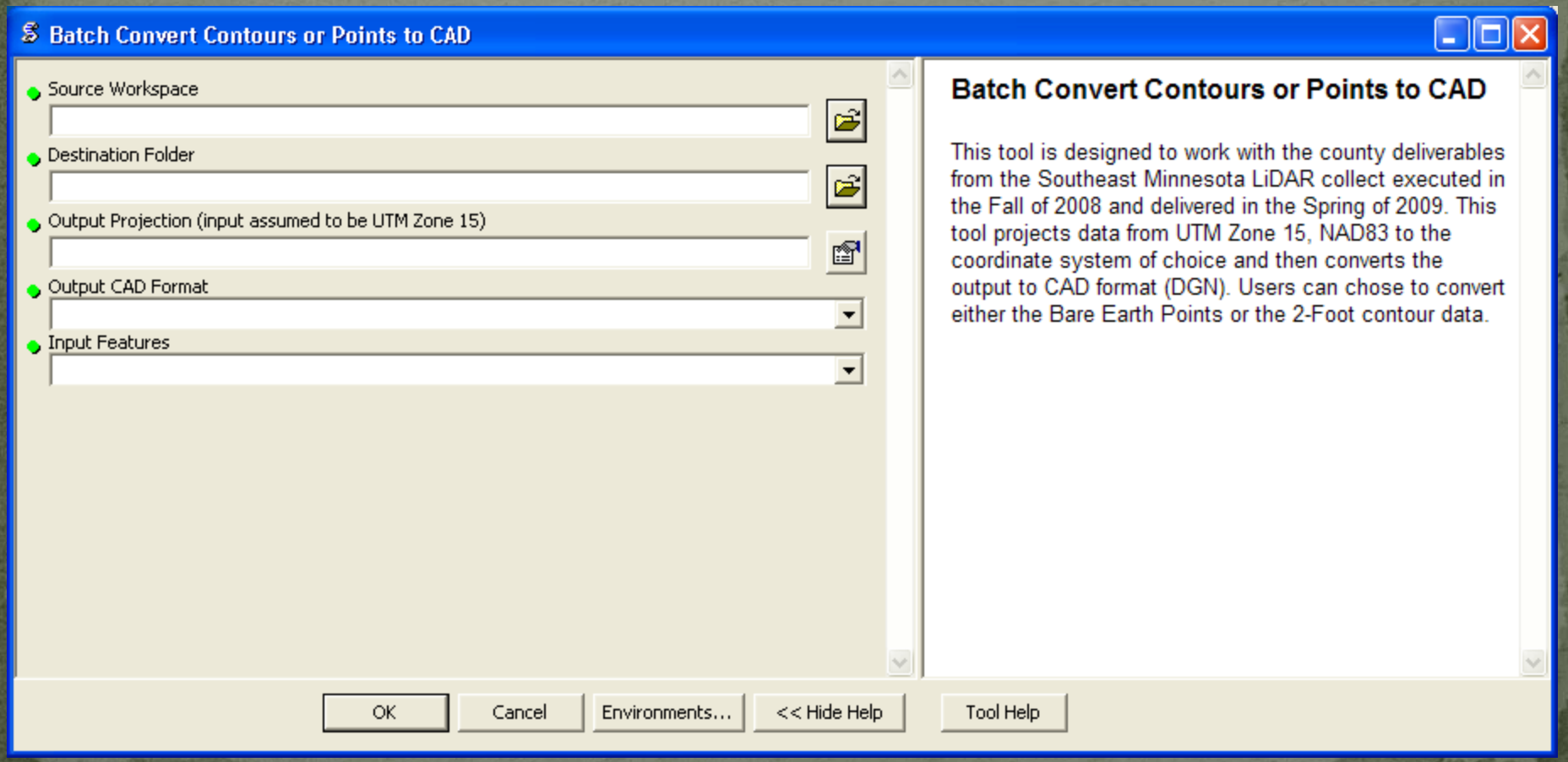
DEM/LiDAR Tips and Tricks

- Current Tool List
  - Batch Convert Contours or Points to CAD
    - Converts data for SE collect to CAD
    - Projects on the fly
  - Calculate Cell Acres
    - Determines true surface area in meters
  - Change Z Values from Meters to Feet
    - Convert the Z-Values in a DEM from Meters to Feet
  - Identify Bluffs
    - Identify Bluff Areas
  - LAS to Contour 9.3
    - Convert LAS file to Grids and then to C
  - Points to X,Y,Z ASCII
    - Convert Points to ASCII x,y,z files
  - Raster Split
    - Reproduces Vector split command
  - Wetness Index
    - Creates wetness index – aka Compound Topographic Index



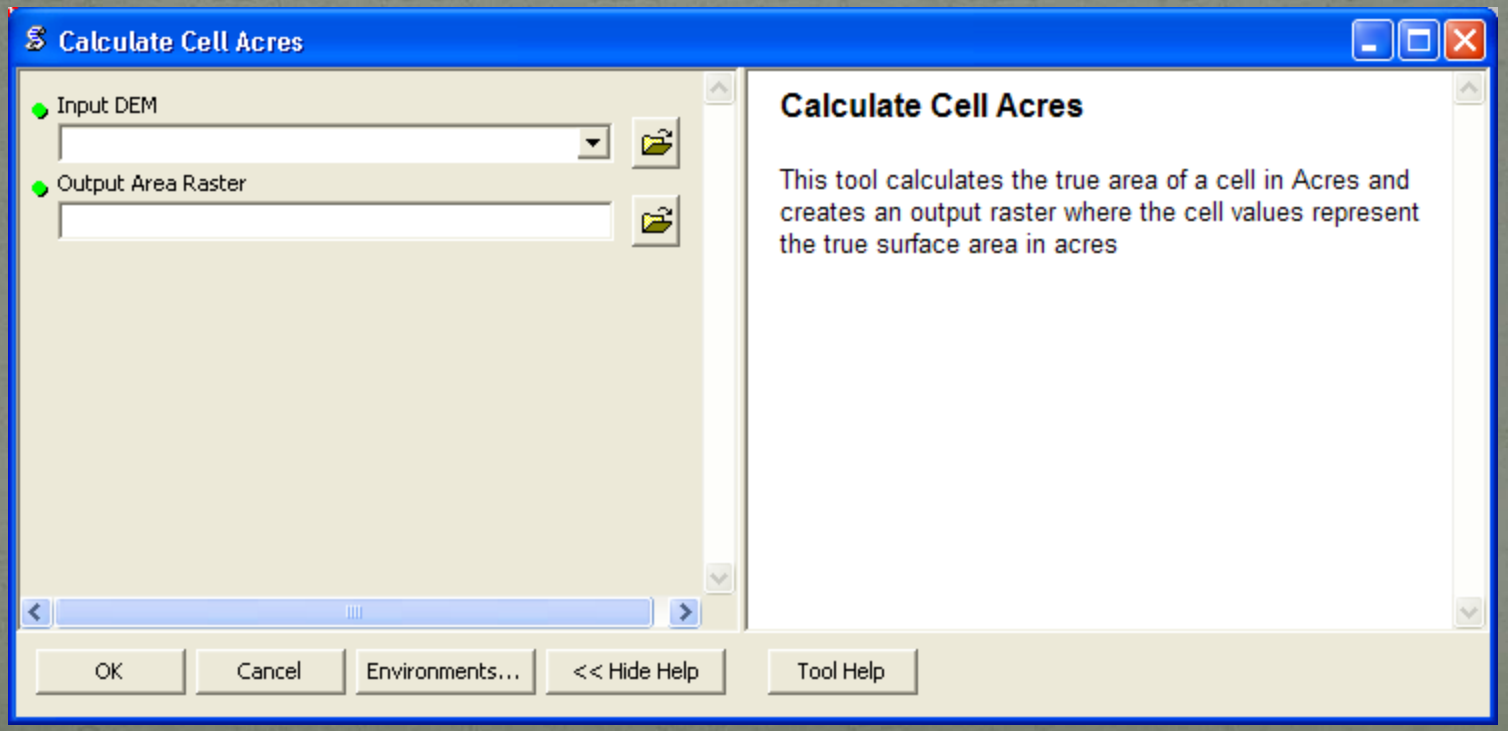
DEM/LiDAR Tips and Tricks

- Batch Convert Contours or Points to CAD



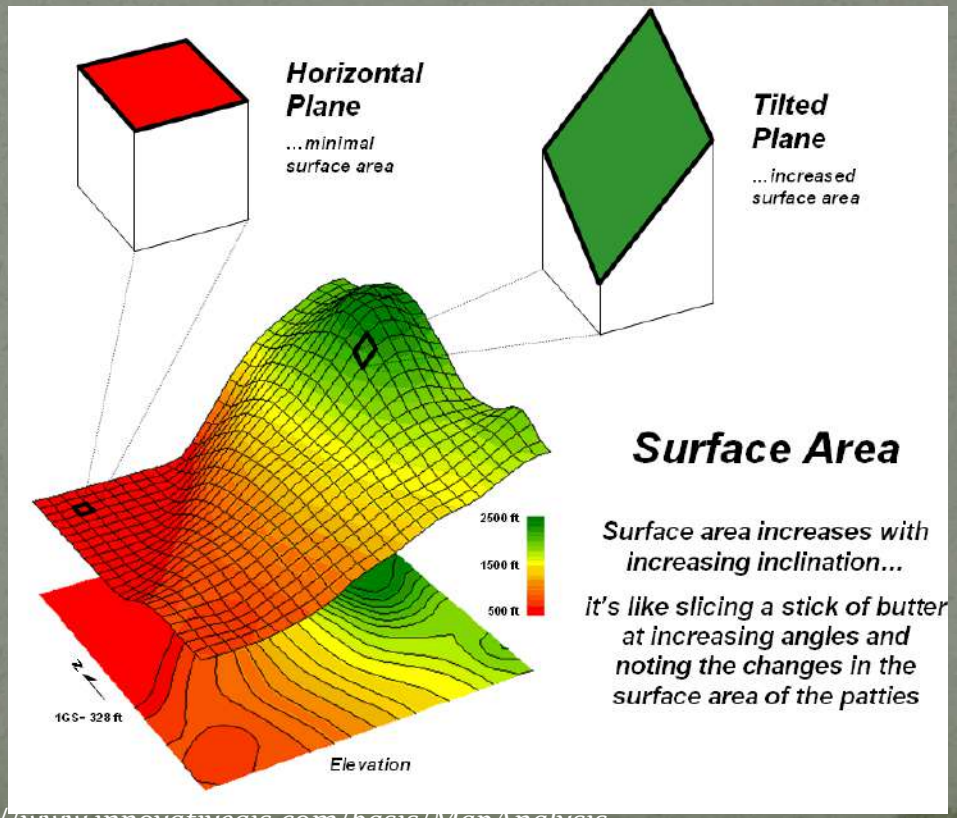
DEM/LiDAR Tips and Tricks

- Calculate Surface Area in Acres
  - Can then calculate true surface area for polygons



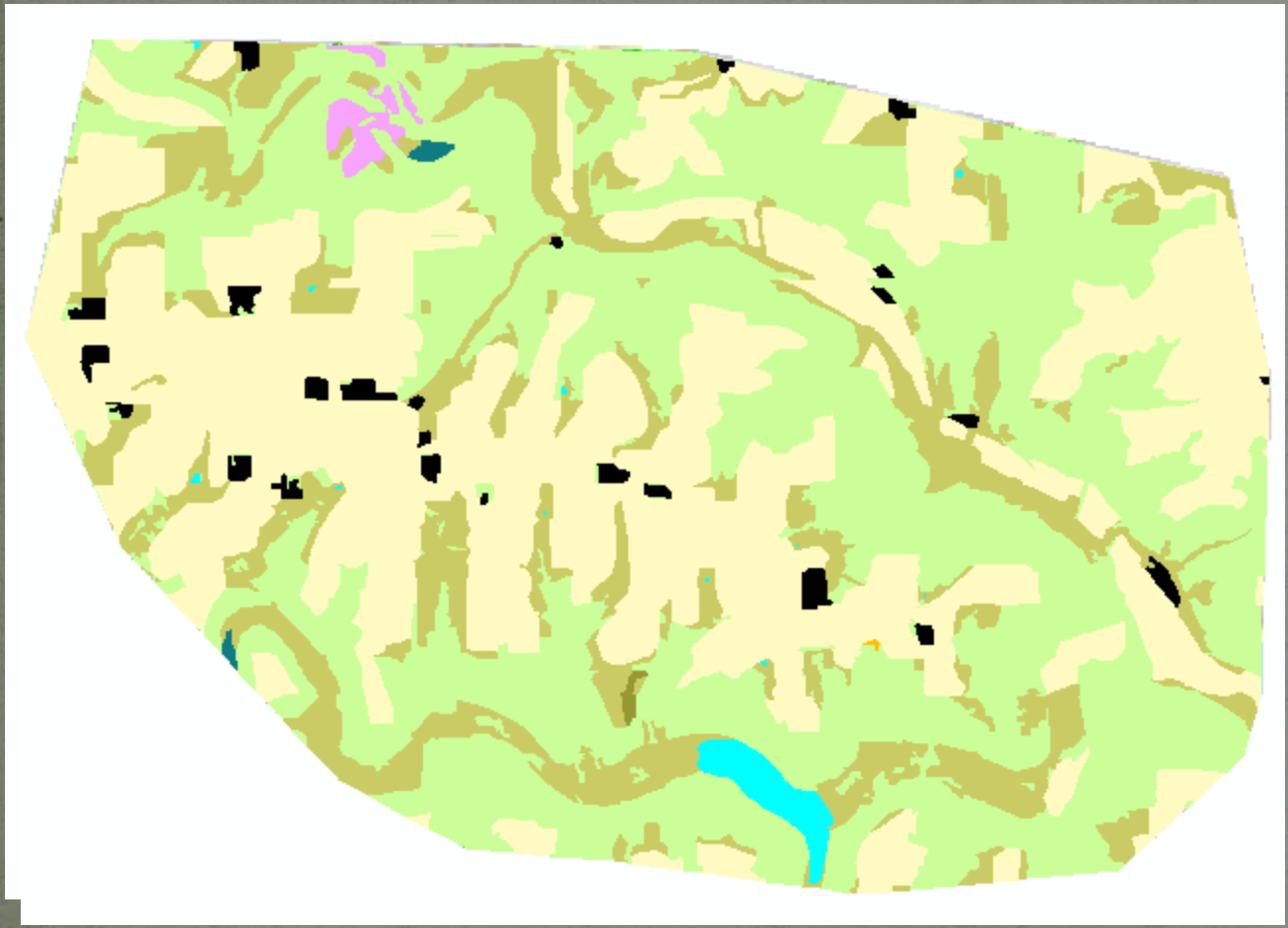
DEM/LiDAR Tips and Tricks

- Determine True Surface Area
  - Surface area increases with slope



From *Beyond Mapping III – Joseph K Berry, http://www.innovativegis.com/basis/MapAnalysis*

DEM/LiDAR Tips and Tricks



Cell values are acres
Max - 0.013
Min - 0.002

DEM/LiDAR Tips and Tricks

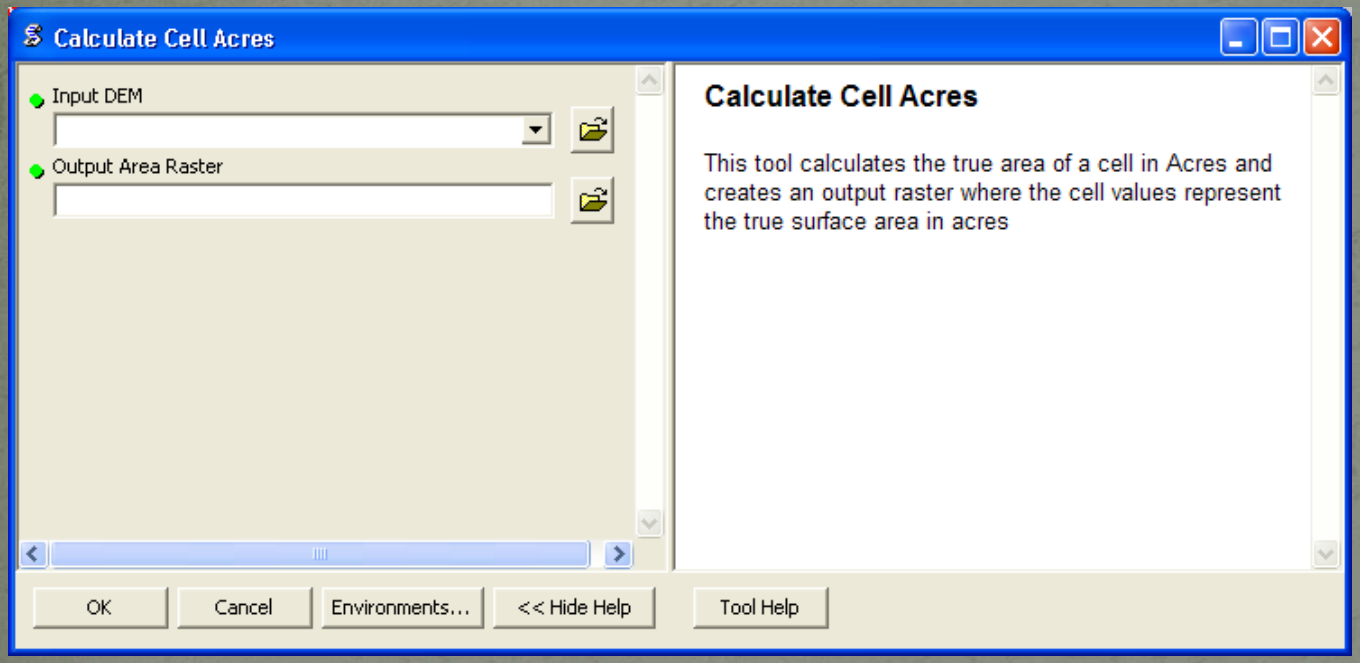
Attributes of zonalst_lumerge1

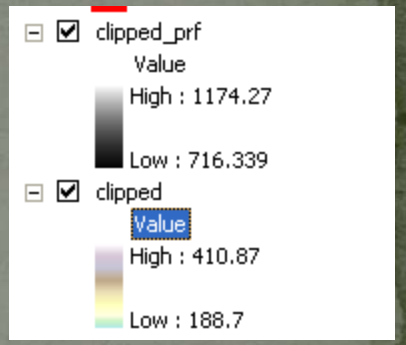
Area in Sq Meters	Surface Area Acres	Planar Acres	DIFFERENCE	LAND_COVER
239265	59.666332	59.122383	0.543949	Farmsteads and Rural Residences
7721775	1923.478	1908.0507	15.427368	Cultivated Land
2223	0.566051	0.549303	0.016747	Transitional Agricultural Land
3135285	794.95227	774.72894	20.223328	Grassland
14418	4.03229	3.562688	0.469602	Grassland-Shrub-Tree (deciduous)
8867538	2375.9771	2191.1687	184.80835	Deciduous Forest
155898	39.065998	38.522396	0.543602	Water
24399	6.08925	6.028993	0.060256	Wetlands
100845	27.034088	24.9188	2.115288	Gravel Pits and Open Mines

Record: 0 Show: All Selected Records (0 out of 9 Selected) Options

DEM/LiDAR Tips and Tricks

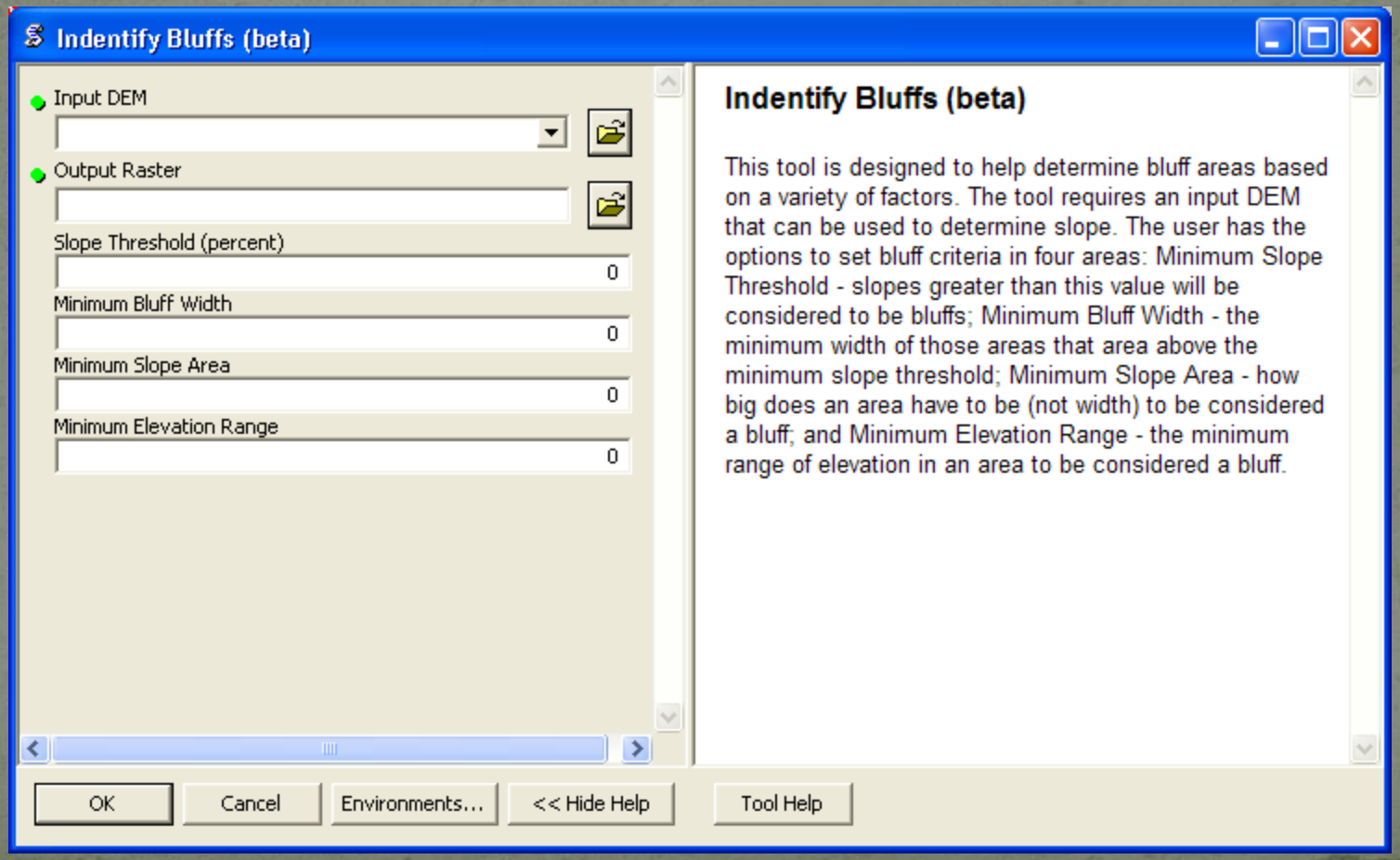
- Change Z-Values from Meters to Feet





DEM/LiDAR Tips and Tricks

- Identify Bluffs

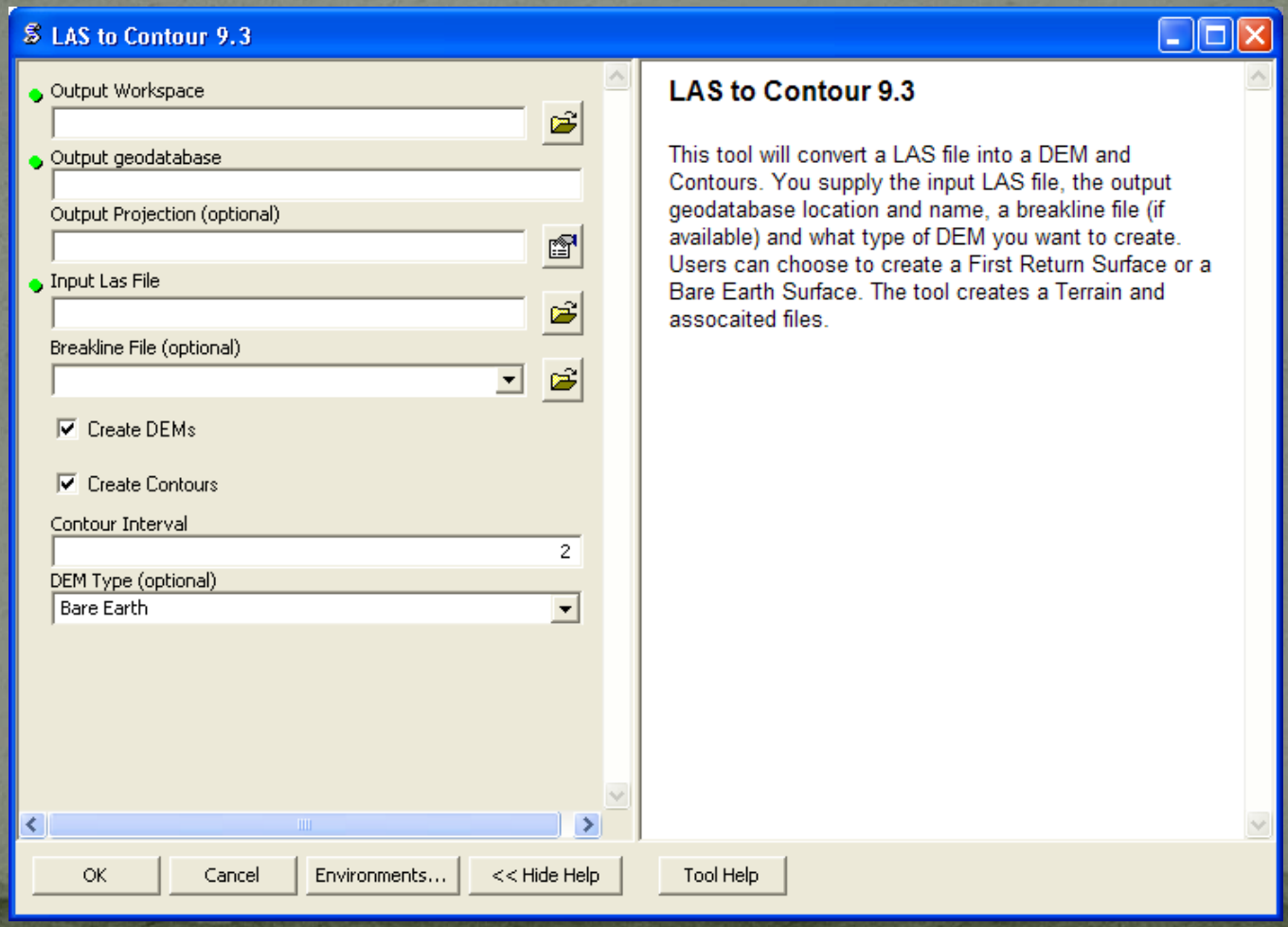


DEM/LiDAR Tips and Tricks

Light Green areas represent those areas that are > 18% slope, with 25’ or more of relief and are larger than 50 square feet in size

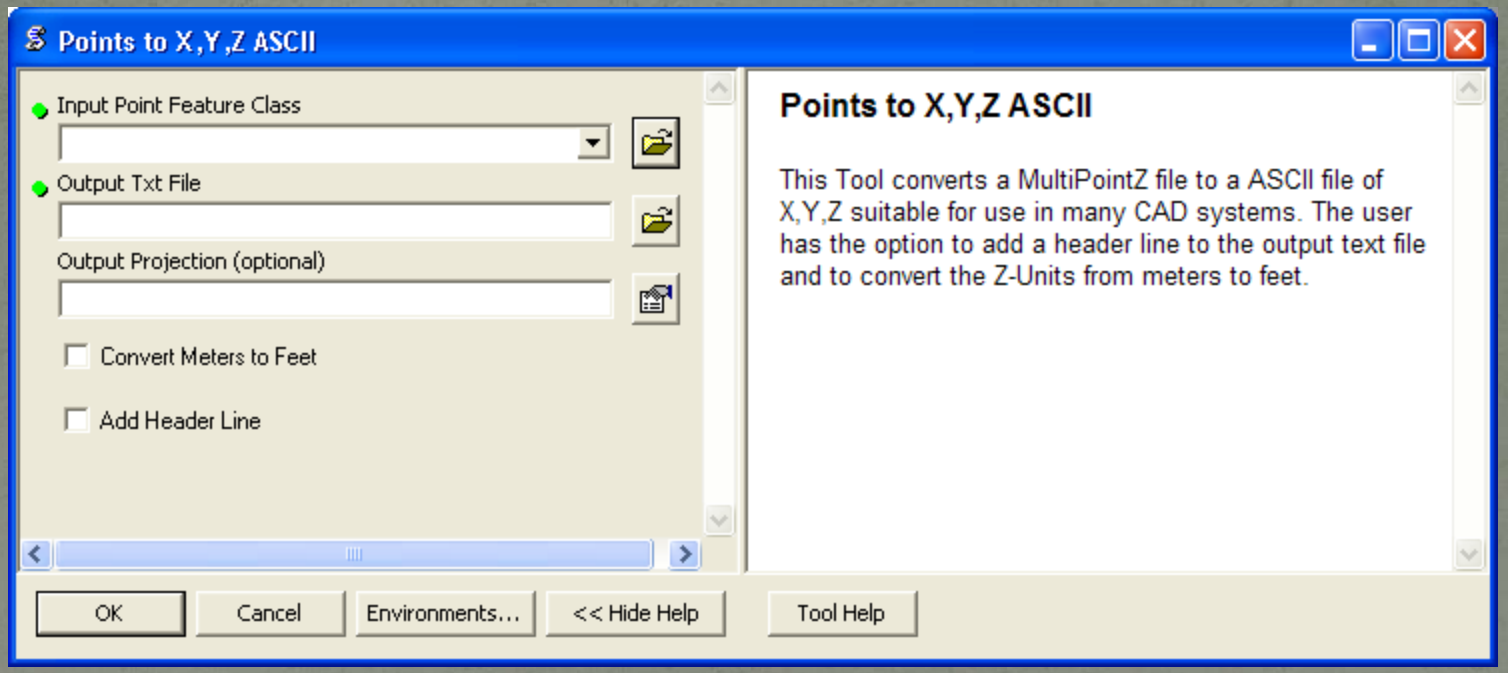
DEM/LiDAR Tips and Tricks

- LAS to Contour 9.3



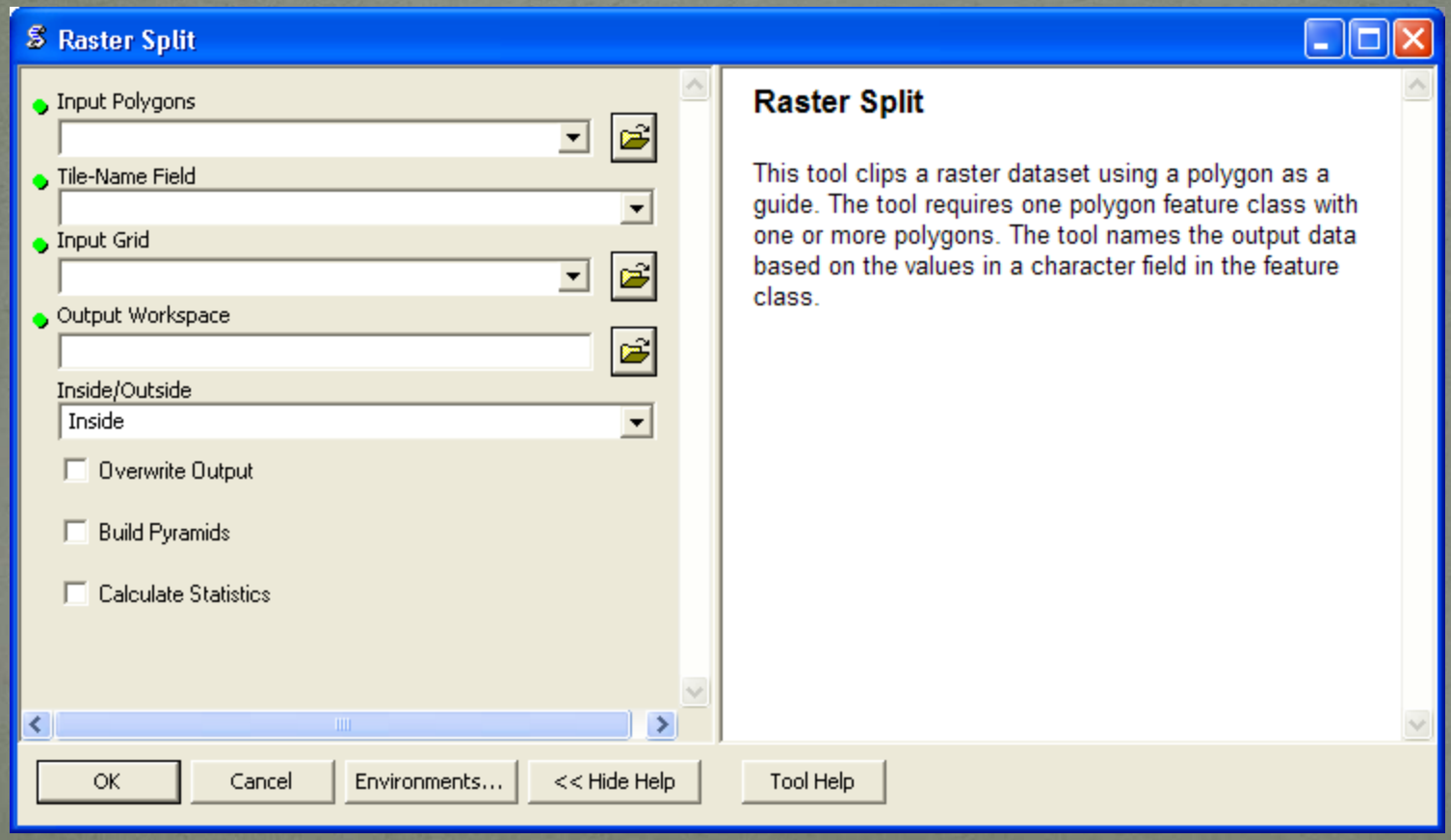
DEM/LiDAR Tips and Tricks

- Points to X,Y,Z ASCII



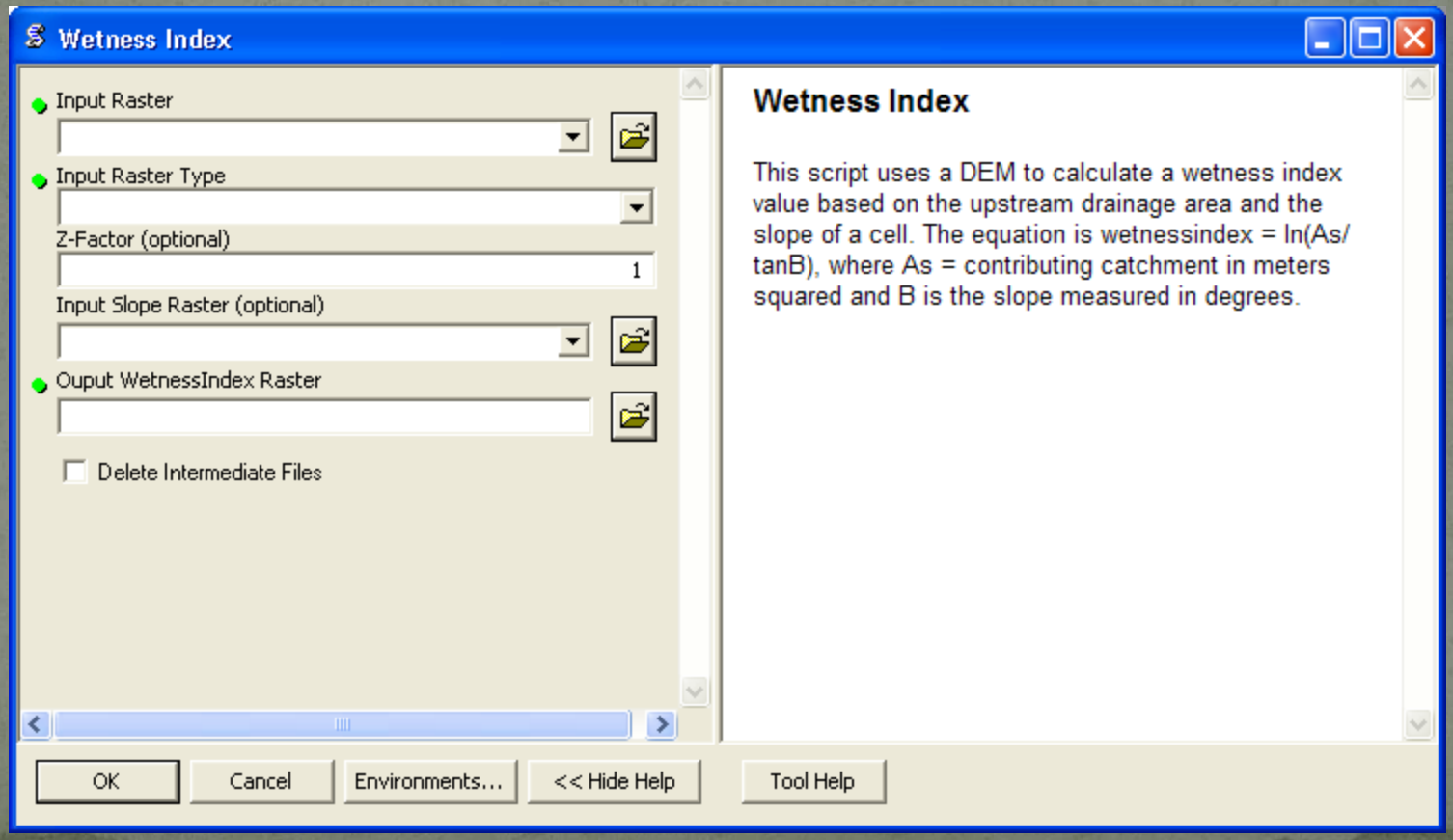
DEM/LiDAR Tips and Tricks

- Raster Split



DEM/LiDAR Tips and Tricks

- Wetness Index



DEM/LiDAR Tips and Tricks

- Toolset will expand over time
- These are some basic tips
- I need you to work this data and come up with ideas
- We will help implement them

DEM/LiDAR Tips and Tricks

- Thanks for your cooperation!
- Q & A