LiDAR and DEM Tips and Tricks

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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.

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

This is what you get



ayer Properties			? 🔀			
General Source Extent Di	isplay Symbolo	ogy Fields Joins & Relates				
☐ Show Map <u>Tips</u> (uses prim	ary display field)					
Display raster resolution in table of contents						
Allow interactive display for	or Effects toolba	ar				
Resample during display using:	:					
Nearest Neighbor (for discret	e data)					
⊆ontrast: Brightness:	0 %	Orthorectification using elevation Oconstant glevation:				
Tra <u>n</u> sparency:	0 %	Elevation adjustment				
Display Quality Coarse Medium Nor	rmal	Z off <u>s</u> et: Geoid:				
		OK Cancel App	dy			

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

Adding Color

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

ow:	Draw raster stretching values along a color ramp	Import
nique Values lassified		
retched		<u></u>
	Color Value Label	
	410.869995 High : 410.869995	
	188.699982 Low 188.699982	
	Color Ramp:	•
Manual Contract	Use hillshad	
	Stretch	
	Type: Standard Deviations <u>Histogra</u>	ams
CHARLE .	n <u>i</u> 2	
Sector Contractor		~



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



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

	Layer Properties	? 🕨
Value High : 410.87 Low : 188.7 Value Value High : 254 Low : 0	General Source Extent Display Symbology Fields Joins & Relates Show Map Ijps (uses primary display field) Display raster resolution in table of contents Allow interactive display for Effects toolbar Resample during display using: Image: Contrast: Image: Contras	
	OK Cancel Apr	ply

 But you can bring out more by controlling the way that statistics are used for the display

All datasetsCurrent ExtentCustom Settings

Inique Values	 Draw raster stretching values along a color ramp 	Import	
Elassified Stretched			^
	Display Background Value: Display NoData as Stretch	-	
	Type: Standard Deviations ni 2	•	
	Apply Gamma Stretch:		
ATP A	Uses the statistics froi From Each Raster Dataset From Custom Settings (below)		

Printing

- If you use the Display Extent for Statistics • You'll have trouble printing To resolve....
 - Save the settings as XMLImport Custom Settings



Raster Processing –

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



 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

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

Clipping Data Part of Raster Processing Toolset

🏞 Clip			
Input Raster		Clip	
Elevation	🗃 🗃		
Output Extent (optional)		Creates a spatial subset of a raster dataset.	
test	2		
Rectangle Y Maximum			
4032501.005417			
X Minimum X Maximum			
623805.725281 629825.260742	*		
Y Minimum			
4828443.967041 H1 Clear	1		
	1		
Use Input Features for Clipping Geometry (optional)			
Output Raster Dataset			
D:\temp\clipped	1		
NoData Value (optional)			
	~		
<			
OK Cancel Environments << F	Hide Help	Tool Help	



 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

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





Reclass to identify those areas that have high slopes



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

DNR Tools for DEM and LiDAR processing
LiDAR and DEM Tools toolbox
Formerly SEMN LiDAR Tools
Available for free at

A growing set of tools based on user input and demand

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 Ma 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

LiDAR and DEM Tools Batch Convert Contours or Points to CAD Calculate Cell Acres Change Z values from Meters to Feet Indentify Bluffs (beta) LAS to Contour 9.3 Points to X,Y,Z ASCII Raster Split Wetness Index

DEM/LiDAR Tips and TricksBatch Convert Contours or Points to CAD

S Batch Convert Contours or Points to CAD



Source Workspace		Batch Convert Contours or Points to CAD
Destination Folder Output Projection (input assumed to be UTM Zone 15) Output CAD Format Input Features		This tool is designed to work with the county deliverables from the Southeast Minnesota LiDAR collect executed in the Fall of 2008 and delivered in the Spring of 2009. This tool projects data from UTM Zone 15, NAD83 to the coordinate system of choice and then converts the output to CAD format (DGN). Users can chose to convert either the Bare Earth Points or the 2-Foot contour data.
OK Cancel Environments << H	Hide Help	Tool Help

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

S Calculate Cell Acres	
• Input DEM	Calculate Cell Acres
Output Area Raster	This tool calculates the true area of a cell in Acres and creates an output raster where the cell values represent the true surface area in acres
OK Cancel Environments << Hide Help	Tool Help

Determine True Surface Area Surface area increases with slope



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



Cell values are acres Max - 0.013 Min - 0.002

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

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Record: 14 4

0 + + Show: All Selected

Records (0 out of 9 Selected)

Options 👻

Change Z-Values from Meters to Feet



Identify Bluffs

Indentify Bluffs (beta)

🖕 Input DEM		
	💽 🖻	
🖕 Output Raster		
Slope Threshold (percent)		
	0	
Minimum Bluff Width		
	0	
Minimum Slope Area	0	
Minimum Elevation Dange	U	
Minimum Elevation Range	0	
1		
		V
<	>	
OK Cancel Environments	<< Hide Help	

Indentify Bluffs (beta)

This tool is designed to help determine bluff areas based on a variety of factors. The tool requires an input DEM that can be used to determine slope. The user has the options to set bluff criteria in four areas: Minimum Slope Threshold - slopes greater than this value will be considered to be bluffs; Minimum Bluff Width - the minimum width of those areas that area above the minimum slope threshold; Minimum Slope Area - how big does an area have to be (not width) to be considered a bluff; and Minimum Elevation Range - the minimum range of elevation in an area to be considered a bluff.

Tool Help

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

• LAS to Contour 9.3

S LAS to Contour 9.3

• Output Workspace	LAS to Contour 9.3
Output geodatabase Output Projection (optional) Input Las File Breakline File (optional) I Create DEMs	This tool will convert a LAS file into a DEM and Contours. You supply the input LAS file, the output geodatabase location and name, a breakline file (if available) and what type of DEM you want to create. Users can choose to create a First Return Surface or a Bare Earth Surface. The tool creates a Terrain and assocaited files.
Create Contours Contour Interval 2 DEM Type (optional)	
Bare Earth	
	8
OK Cancel Environments << Hide Help	Tool Help

DEM/LiDAR Tips and TricksPoints to X,Y,Z ASCII

S Points to X,Y,Z ASCII	
 Input Point Feature Class Input Point Feature Class 	Points to X,Y,Z ASCII
• Output Txt File	This Tool converts a MultiPointZ file to a ASCII file of X,Y,Z suitable for use in many CAD systems. The user
Output Projection (optional)	has the option to add a header line to the output text file and to convert the Z-Units from meters to feet.
Convert Meters to Feet	
🗖 Add Header Line	
	(
OK Cancel Environments << Hide Help	Tool Help

• Raster Split

S Raster Split

• Input Polygons	Raster Spli
Tile-Name Field	This tool clips guide. The tool
• Input Grid	one or more po based on the v
Output Workspace	CIASS.
Inside/Outside	
Cverwrite Output	
Build Pyramids	
OK Cancel Environments << Hide Help	Tool Help



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a raster dataset using a polygon as a requires one polygon feature class with olygons. The tool names the output data alues in a character field in the feature

Wetness Index

S Wetness Index

Input Raster	Wetness Index
Input Raster Type Z-Factor (optional)	This script uses a DEM to calculate a wetness index value based on the upstream drainage area and the slope of a cell. The equation is wetnessindex = ln(As/tanB), where As = contributing catchment in meters
Input Slope Raster (optional)	squared and B is the slope measured in degrees.
Ouput WetnessIndex Raster	
Delete Intermediate Files	
OK Cancel Environments << Hide Help	Tool Help



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

Thanks for your cooperation!Q & A