

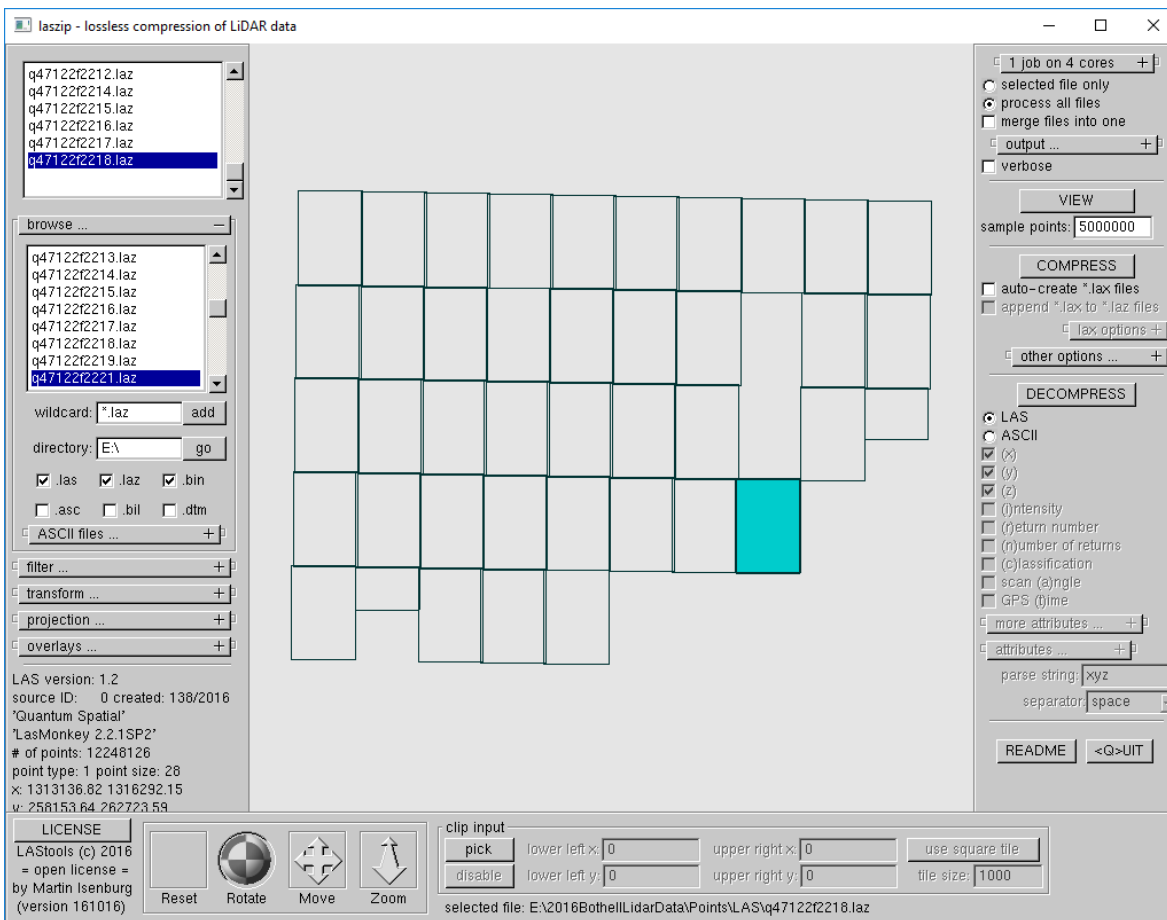


Bothell Lidar Project

Andy Siegel – GIS Technician, City of Bothell

November 1, 2016 – Mercer Island, CPS-GIS User Group Meeting

LAS Zip Tool

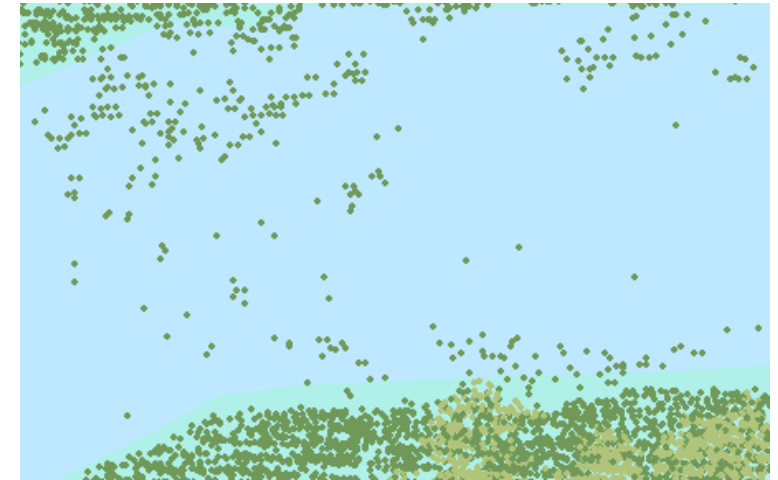


Name	Date modified	Type	Size
q47122f2103.laz	6/8/2016 3:26 PM	LAZ File	173,796 KB
q47122f2104.laz	6/8/2016 3:26 PM	LAZ File	166,301 KB
q47122f2105.laz	6/8/2016 3:26 PM	LAZ File	155,556 KB
q47122f2106.laz	6/8/2016 3:26 PM	LAZ File	160,938 KB
q47122f2107.laz	6/8/2016 3:26 PM	LAZ File	122,298 KB
q47122f2108.laz	6/8/2016 3:27 PM	LAZ File	155,183 KB
q47122f2109.laz	6/8/2016 3:27 PM	LAZ File	131,995 KB
q47122f2110.laz	6/8/2016 3:27 PM	LAZ File	125,702 KB



Name	Date modified	Type	Size
q47122f2103.las	7/29/2016 9:10 AM	LAS File	773,690 KB
q47122f2104.las	7/29/2016 9:10 AM	LAS File	739,299 KB
q47122f2105.las	7/29/2016 9:11 AM	LAS File	703,088 KB
q47122f2108.las	7/29/2016 9:13 AM	LAS File	701,140 KB
q47122f2109.las	7/29/2016 9:14 AM	LAS File	610,185 KB
q47122f2110.las	7/29/2016 9:14 AM	LAS File	584,261 KB

Hydro-flattening approach



Add Surface Information

Input Feature Class: Misc\WaterBody_polygon

Input Surface: Bothell_LAS_PlanningArea.lasd

Output Property:

- ☒ Z_MIN
- ☐ Z_MAX
- ☐ Z_MEAN
- ☐ SURFACE_AREA
- ☐ MIN_SLOPE
- ☐ MAX_SLOPE
- ☐ AVG_SLOPE

Select All Unselect All Add Value

Method (optional): LINEAR

Sampling Distance (optional):

Z Factor (optional): 3.28083333333333

Pyramid Level Resolution (optional): 0

Noise Filtering (optional): NO_FILTER

OK Cancel Environments... << Hide Help Tool Help

Add Surface Information

Attributes features with spatial information derived from a surface.

Table

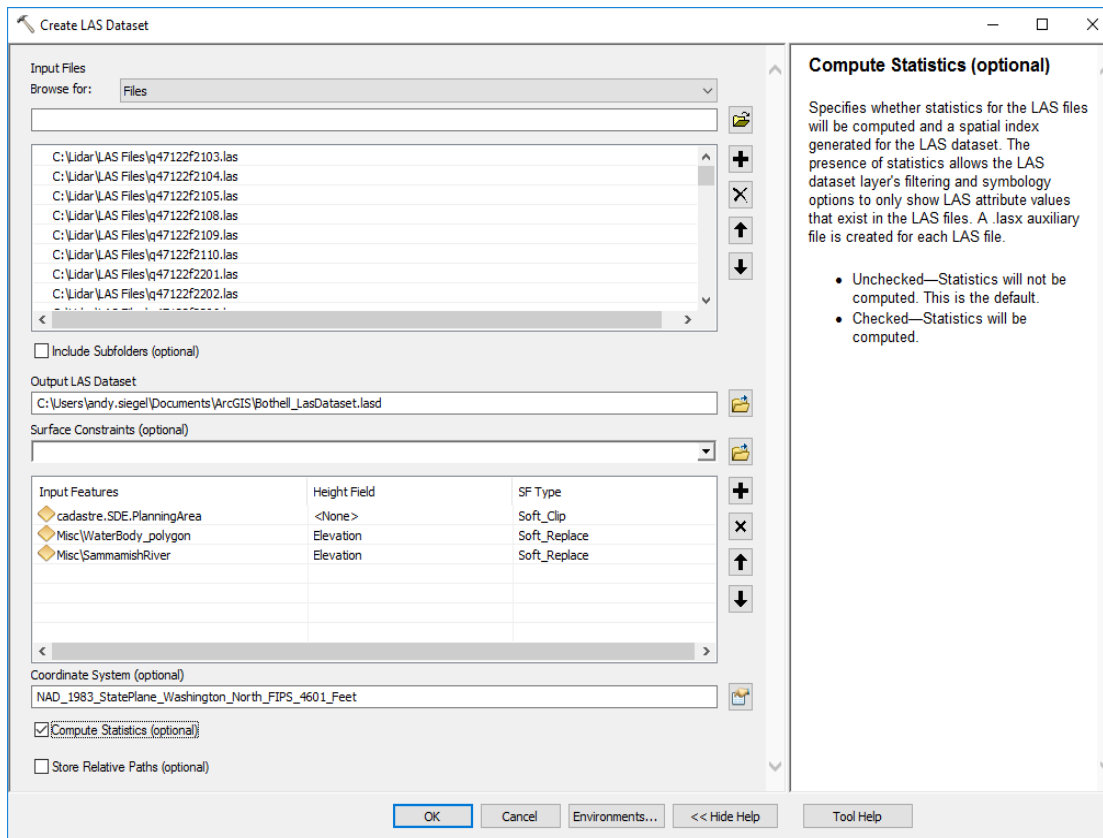
WaterBody_polygon

Type	Name	Elevation
P	Unknow	19
P	Unknow	23
P	Unknow	23
P	Unknow	23
P	Unknow	23
P	Unknow	23
P	Unknow	24
P	Unknow	30
P	Unknow	31

(0 out of 205 Selected)

WaterBody_polygon

Create LAS Dataset (ground returns)



Create LAS Dataset

Input Files
Browse for: Files

C:\Lidar\LAS Files\q47122f2103.las
C:\Lidar\LAS Files\q47122f2104.las
C:\Lidar\LAS Files\q47122f2105.las
C:\Lidar\LAS Files\q47122f2108.las
C:\Lidar\LAS Files\q47122f2109.las
C:\Lidar\LAS Files\q47122f2110.las
C:\Lidar\LAS Files\q47122f2201.las
C:\Lidar\LAS Files\q47122f2202.las

☐ Include Subfolders (optional)

Output LAS Dataset
C:\Users\andy.siegel\Documents\ArcGIS\Bothell_LasDataset.lasd

Surface Constraints (optional)

Input Features	Height Field	SF Type
cadastre_SDE.PlanningArea	<None>	Soft_Clip
Misc\WaterBody_polygon	Elevation	Soft_Replace
Misc\SammamishRiver	Elevation	Soft_Replace

Coordinate System (optional)
NAD_1983_StatePlane_Washington_North_FIPS_4601_Feet

☒ Compute Statistics (optional)

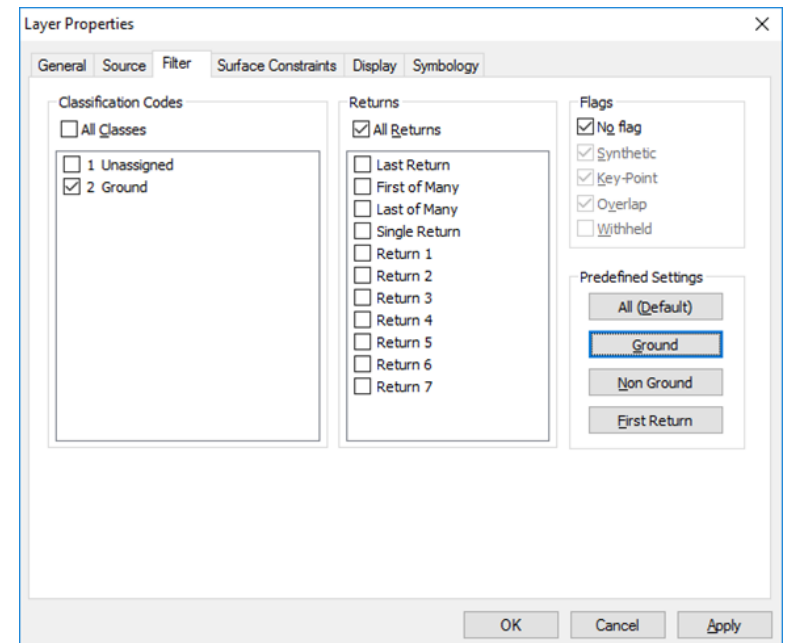
☐ Store Relative Paths (optional)

Compute Statistics (optional)

Specifies whether statistics for the LAS files will be computed and a spatial index generated for the LAS dataset. The presence of statistics allows the LAS dataset layer's filtering and symbology options to only show LAS attribute values that exist in the LAS files. A .lasx auxiliary file is created for each LAS file.

- Unchecked—Statistics will not be computed. This is the default.
- Checked—Statistics will be computed.

OK Cancel Environments... << Hide Help Tool Help



Layer Properties

General Source Filter Surface Constraints Display Symbology

Classification Codes

☐ All Classes

☐ 1 Unassigned
☒ 2 Ground

Returns

☒ All Returns

☐ Last Return
☐ First of Many
☐ Last of Many
☐ Single Return
☐ Return 1
☐ Return 2
☐ Return 3
☐ Return 4
☐ Return 5
☐ Return 6
☐ Return 7

Flags

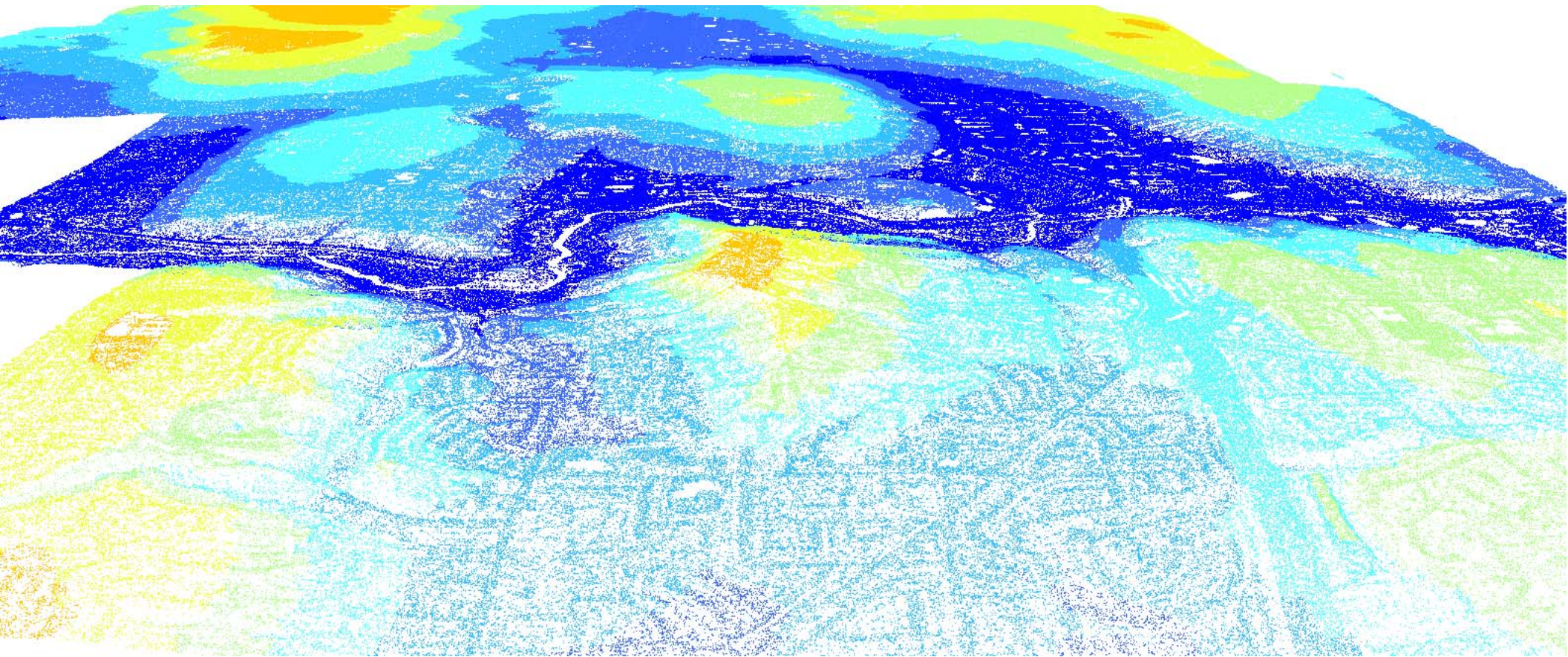
☒ No flag
☒ Synthetic
☒ Key-Point
☒ Overlap
☐ Withheld

Predefined Settings

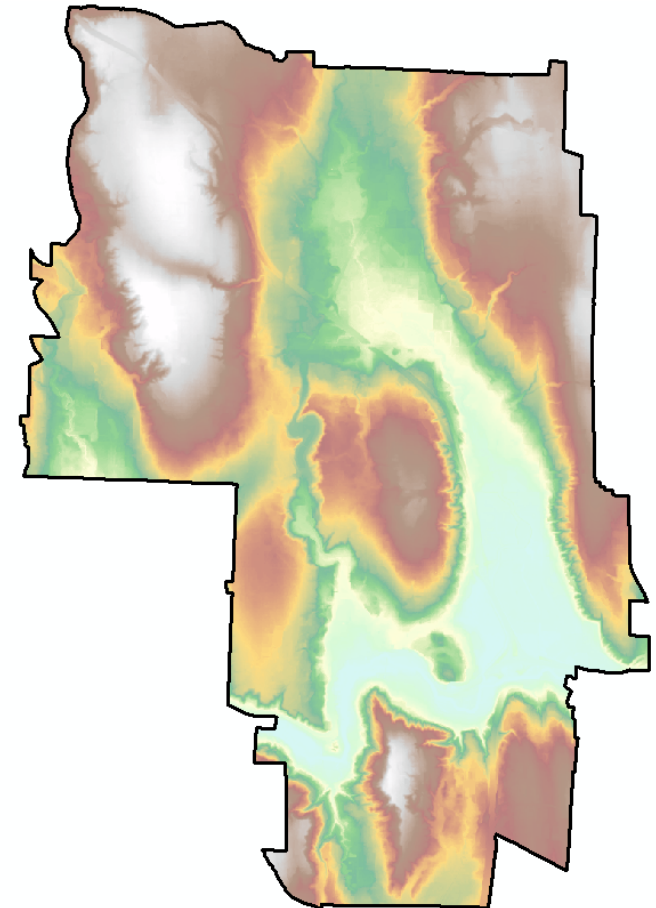
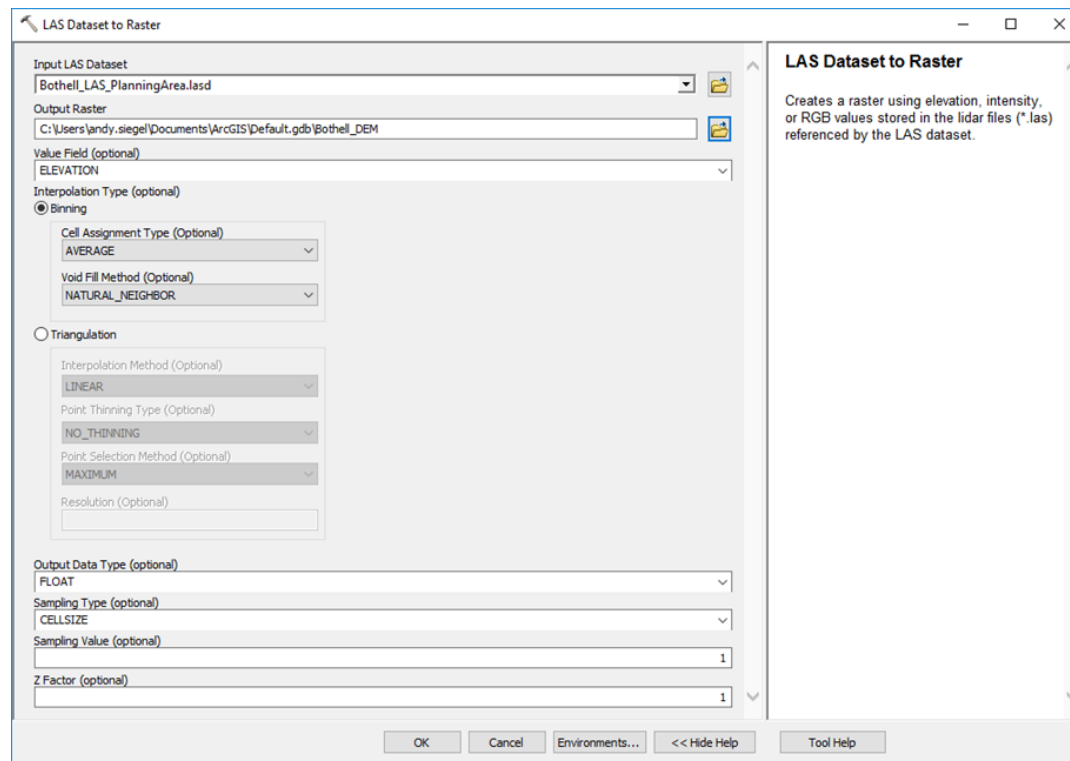
All (Default)
Ground
Non Ground
First Return

OK Cancel Apply

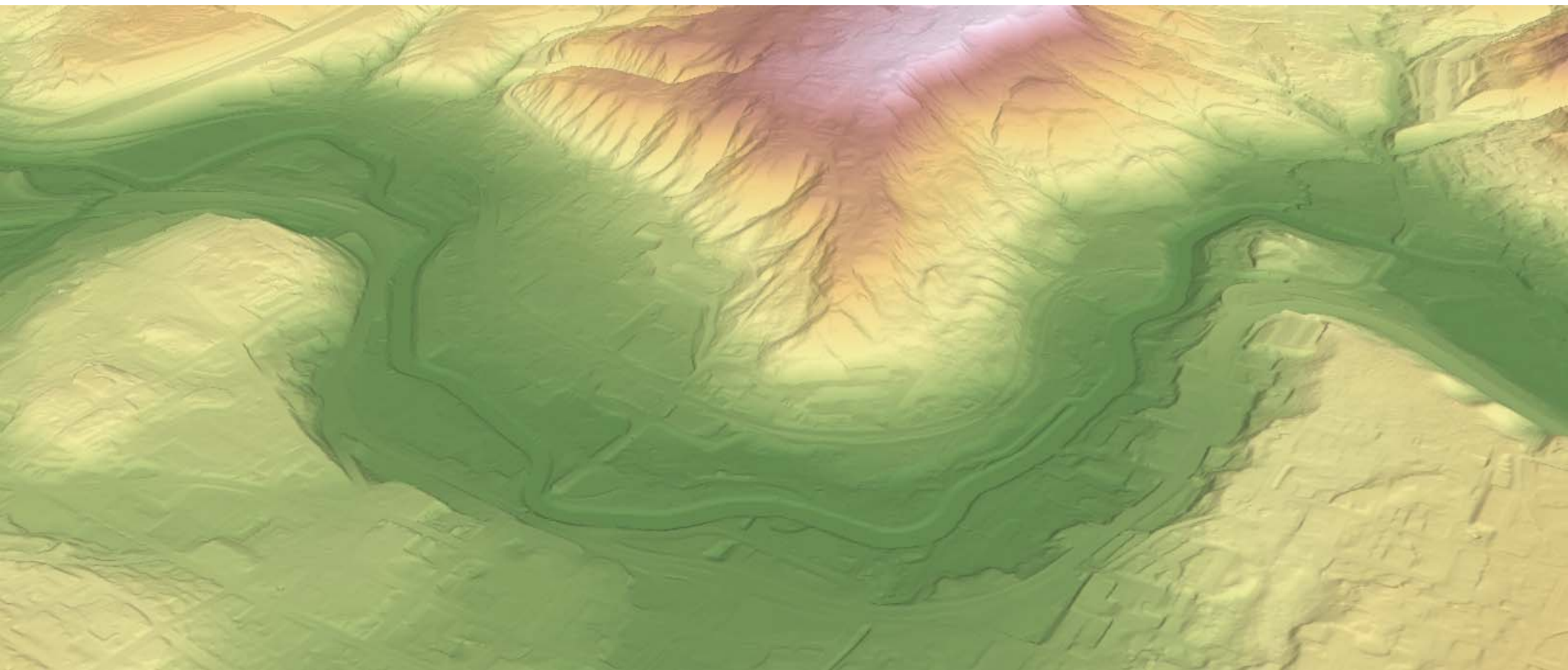
LAS Dataset point cloud (ground returns)



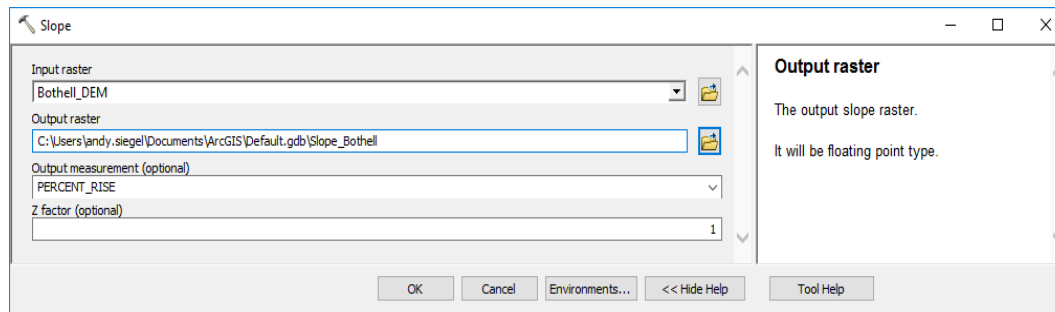
LAS Dataset to Raster



Digital Elevation Model (DEM)

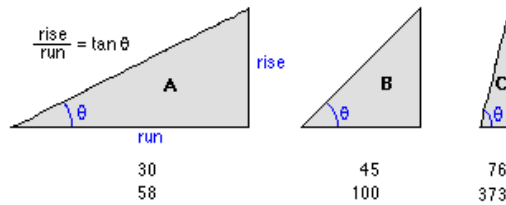


Slope (percent-rise)



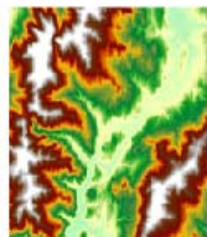
Degree of slope = θ

Percent of slope = $\frac{\text{rise}}{\text{run}} \times 100$

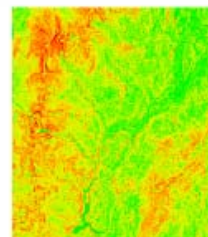


Degree of slope =

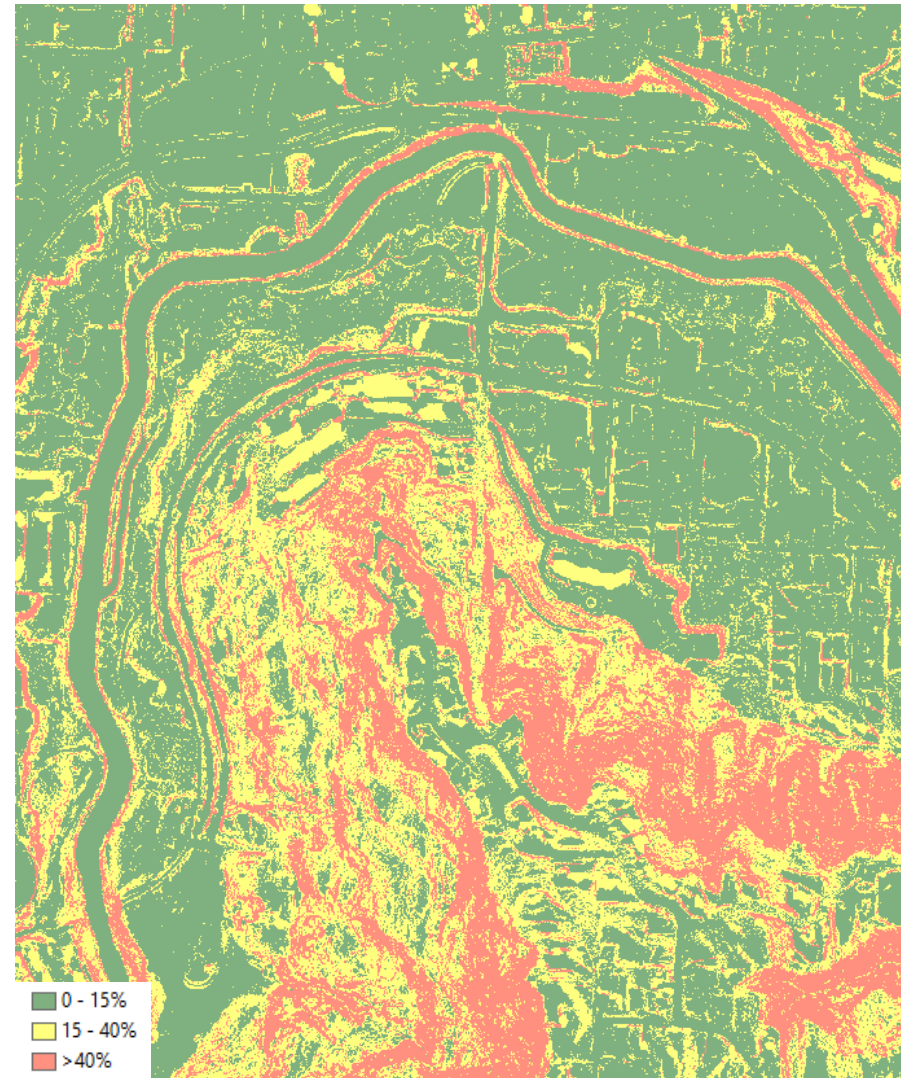
Percent of slope =



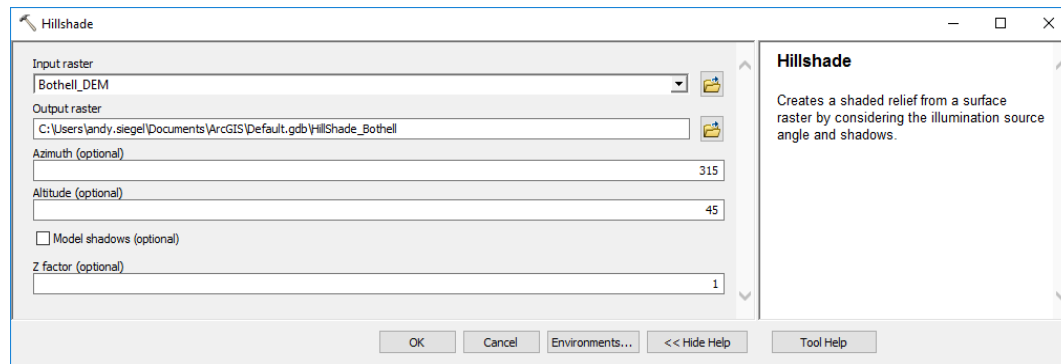
Input elevation raster



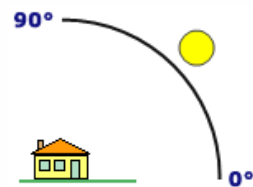
Output slope raster
(in degrees)



Hillshade



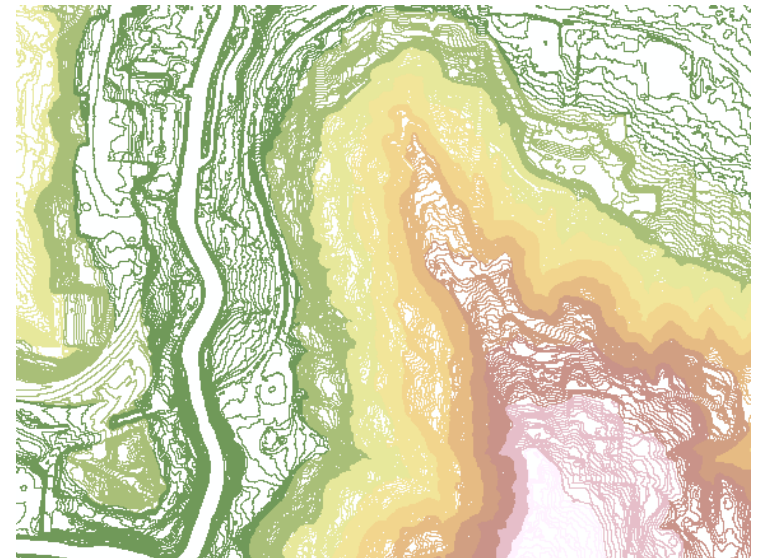
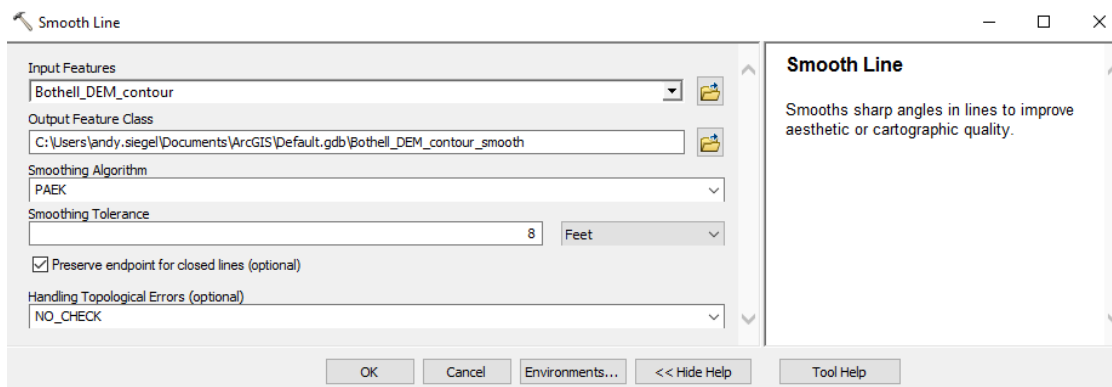
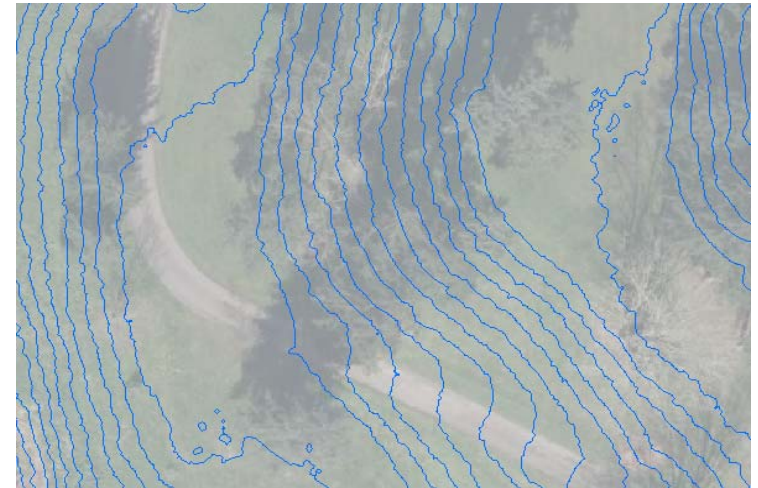
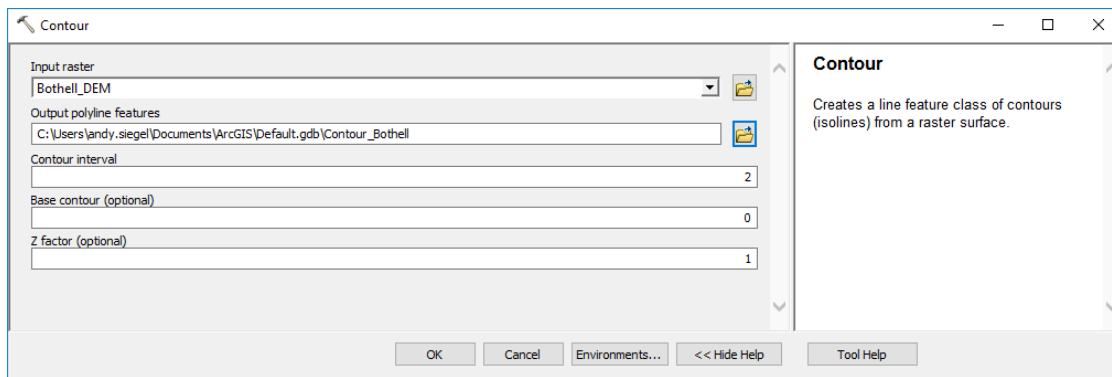
Default sun azimuth (direction) for hillshade is 315°



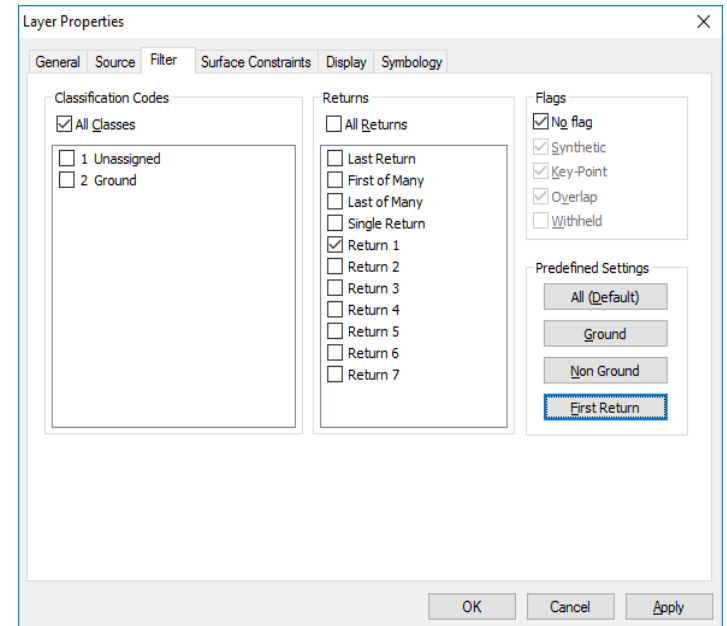
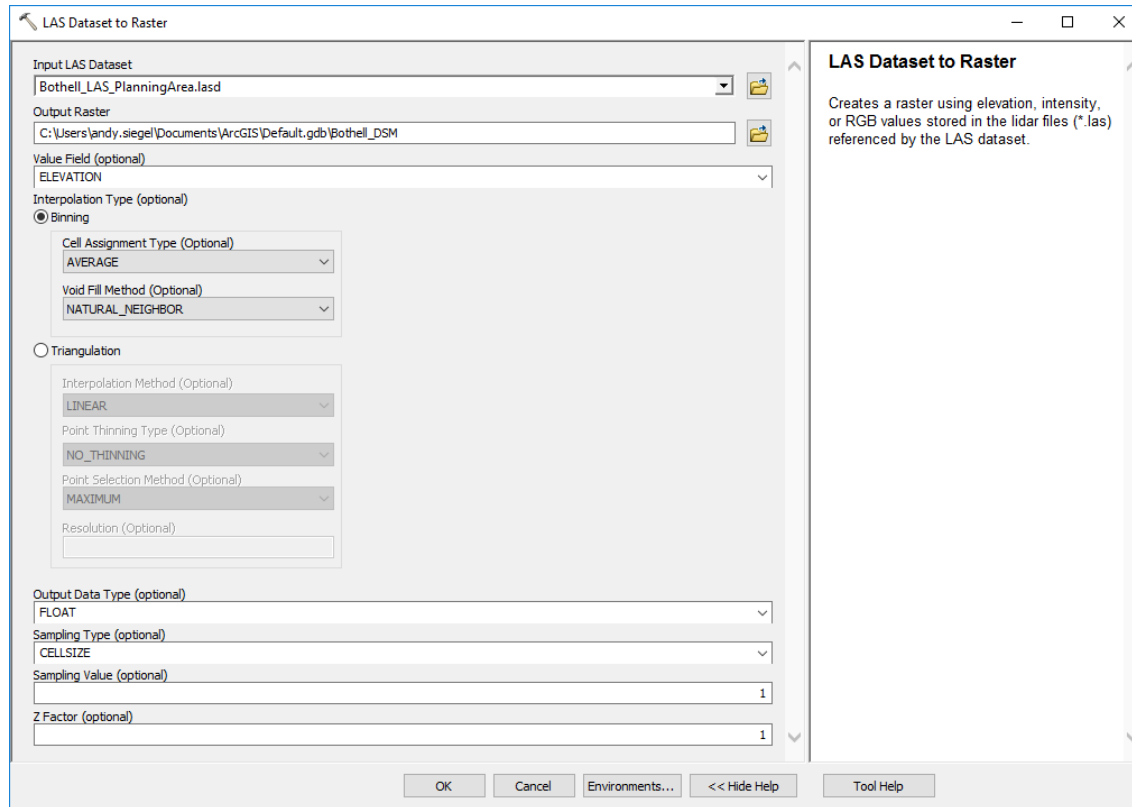
Default sun altitude for hillshade is 45°



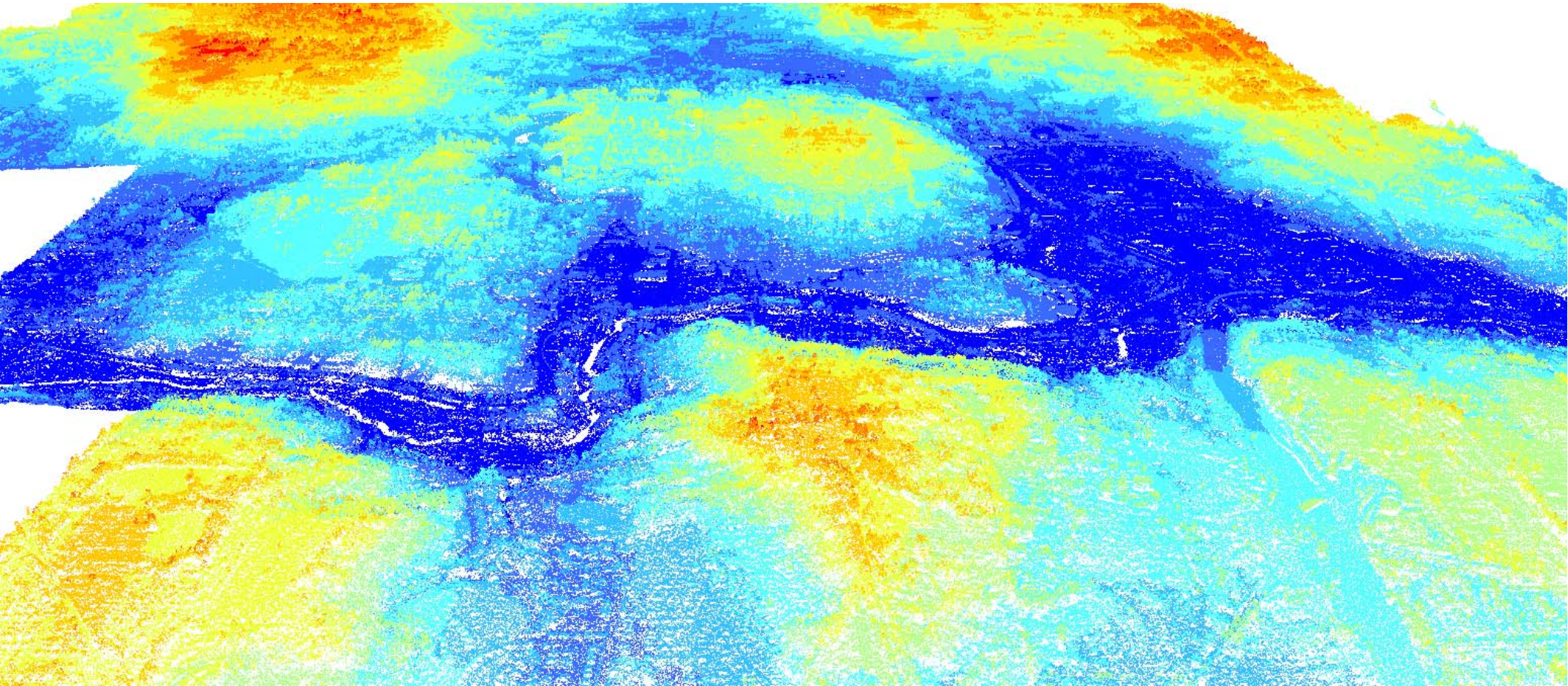
Contours (2-ft interval)



Create LAS Dataset (first returns)



LAS Dataset point cloud (first returns)



LAS Dataset to Raster

LAS Dataset to Raster

Input LAS Dataset
Bothell_LAS_PlanningArea.lasd

Output Raster
C:\Users\landy.siegel\Documents\ArcGIS\Default.gdb\Bothell_DSM

Value Field (optional)
ELEVATION

Interpolation Type (optional)
☒ Binning
☐ Triangulation

Cell Assignment Type (Optional)
AVERAGE

Void Fill Method (Optional)
NATURAL_NEIGHBOR

Interpolation Method (Optional)
LINEAR

Point Thinning Type (Optional)
NO_THINNING

Point Selection Method (Optional)
MAXIMUM

Resolution (Optional)

Output Data Type (optional)
FLOAT

Sampling Type (optional)
CELLSIZE

Sampling Value (optional)
1

Z Factor (optional)
1

Interpolation Type (optional)

The interpolation technique that will be used to determine the cell values of the output raster.

The binning approach provides a Cell Assignment Method for determining each output cell using the points that fall within its extent, along with a Void Fill Method to determine the value of cells that do not contain any LAS points.

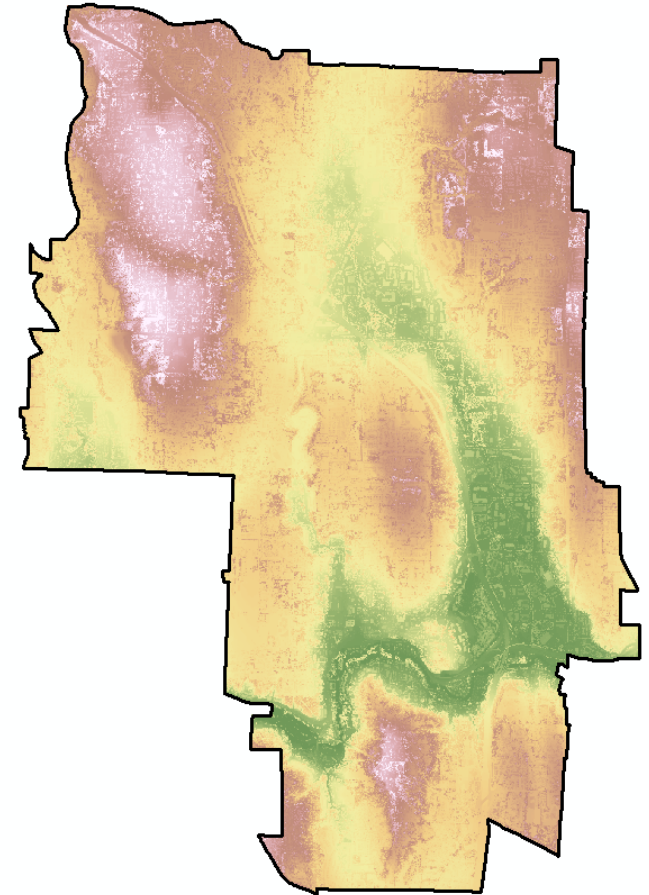
Cell Assignment Methods

- AVERAGE—Assigns the average value of all points in the cell. This is the default.
- MINIMUM—Assigns the minimum value found in the points within the cell.
- MAXIMUM—Assigns the maximum value found in the points within the cell.
- IDW—Uses Inverse Distance Weighted interpolation to determine the cell value.
- NEAREST—Uses Nearest Neighbor assignment to determine the cell value.

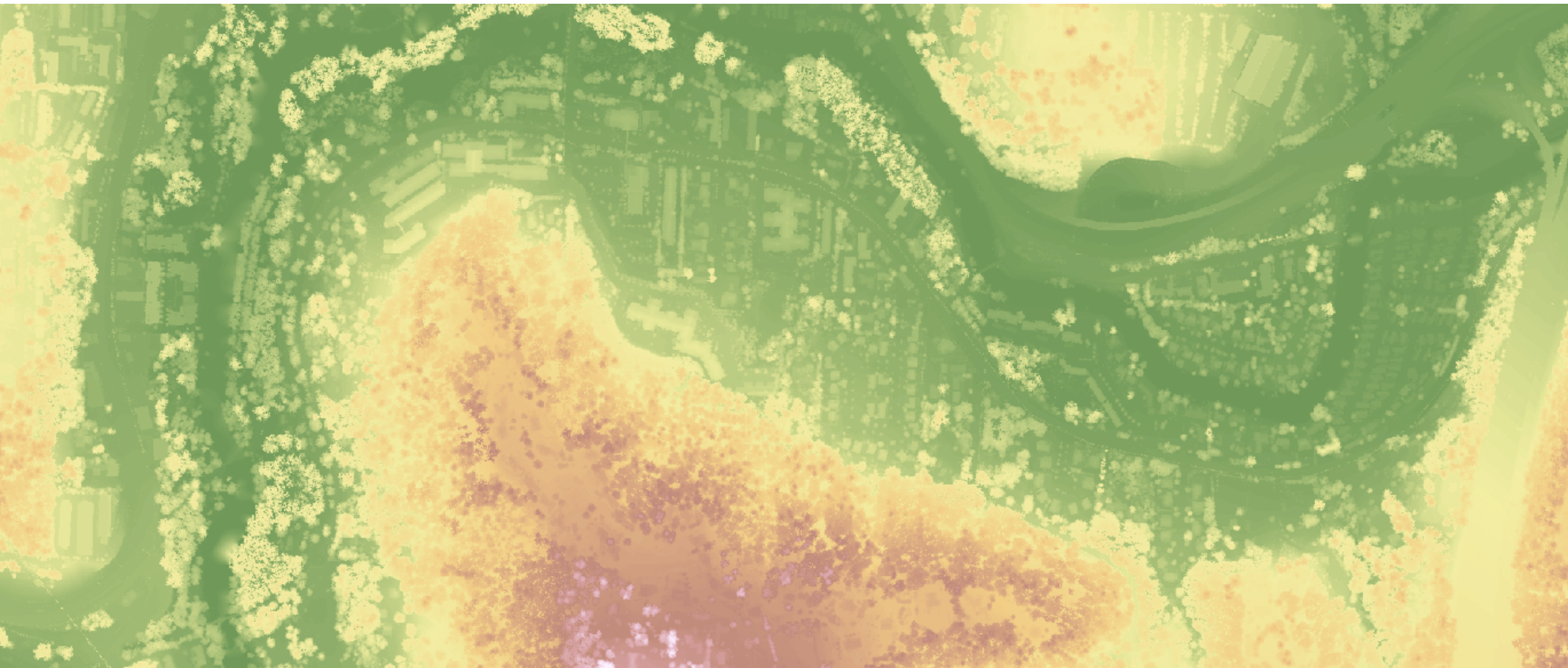
Void Fill Methods

- NONE—NoData is assigned to the cell.
- SIMPLE—Averages the values from data cells immediately surrounding a

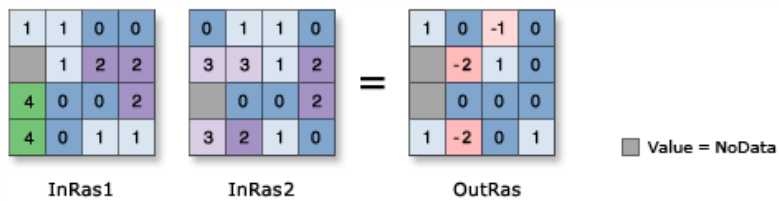
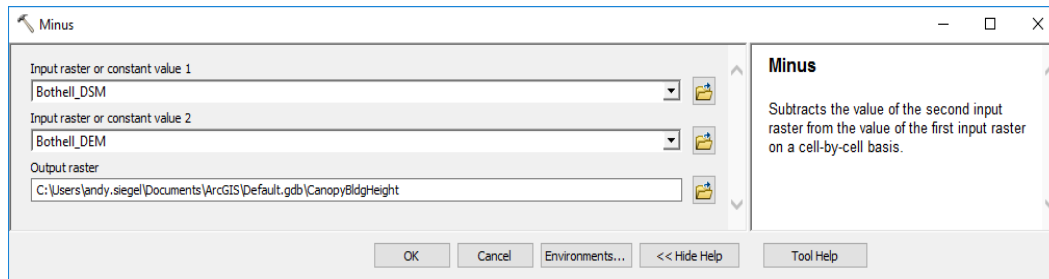
OK Cancel Environments... << Hide Help Tool Help



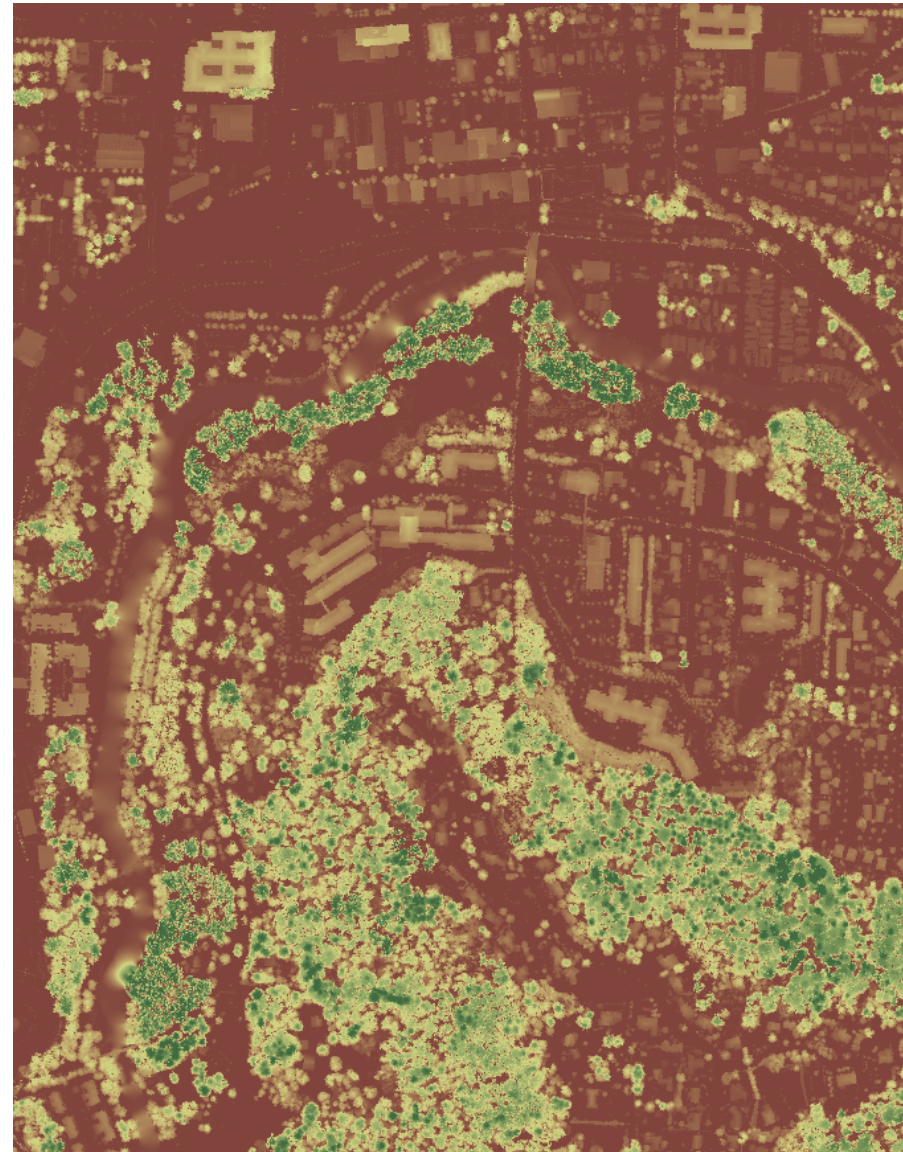
Digital Surface Model (DSM)



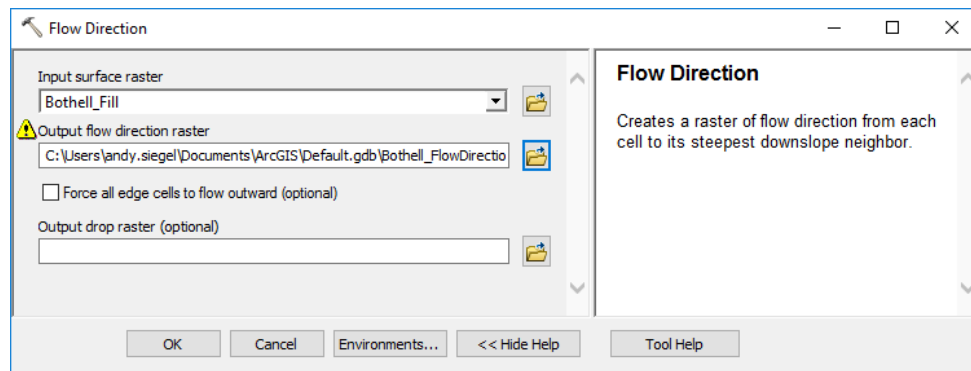
Canopy/Building Height



Minus_3d (InRas1, InRas2, OutRas)



Hydro-corrections: Flow Direction



78	72	69	71	58	49
74	67	56	49	46	50
69	53	44	37	38	48
64	58	55	22	31	24
68	61	47	21	16	19
74	53	34	12	11	12

Elevation surface

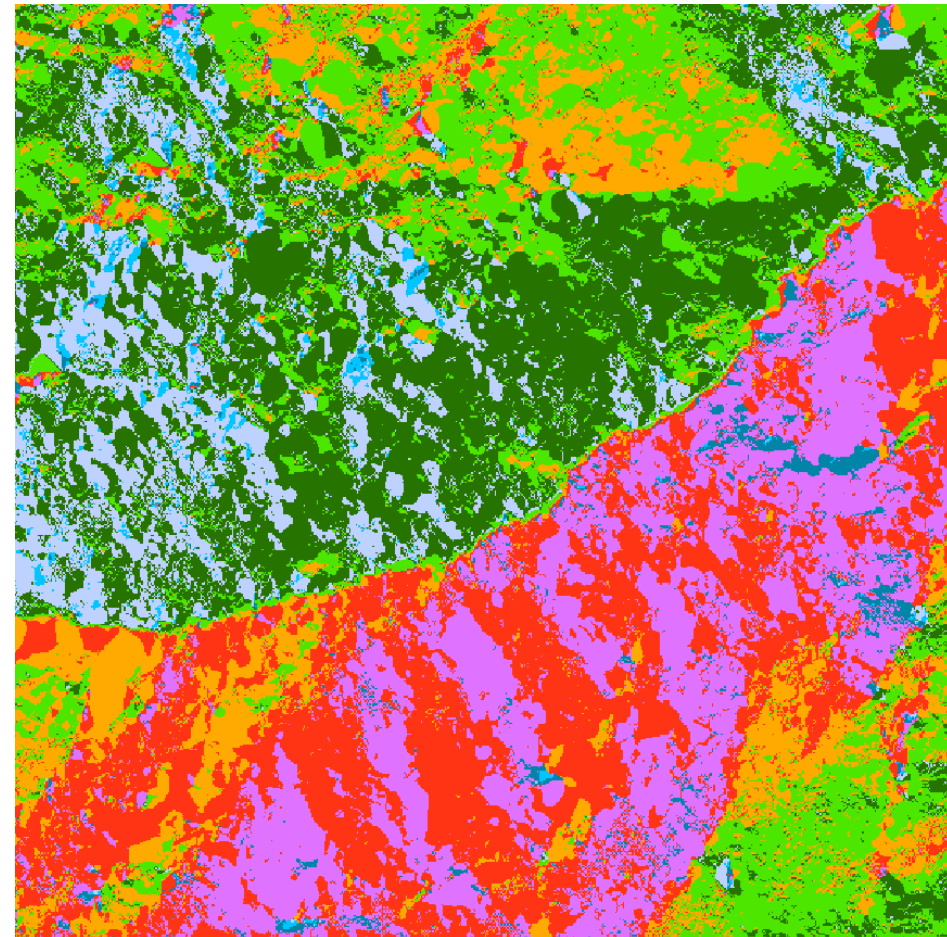


2	2	2	4	4	8
2	2	2	4	4	8
1	1	2	4	8	4
128	128	1	2	4	8
2	2	1	4	4	4
1	1	1	1	4	16

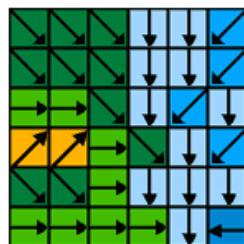
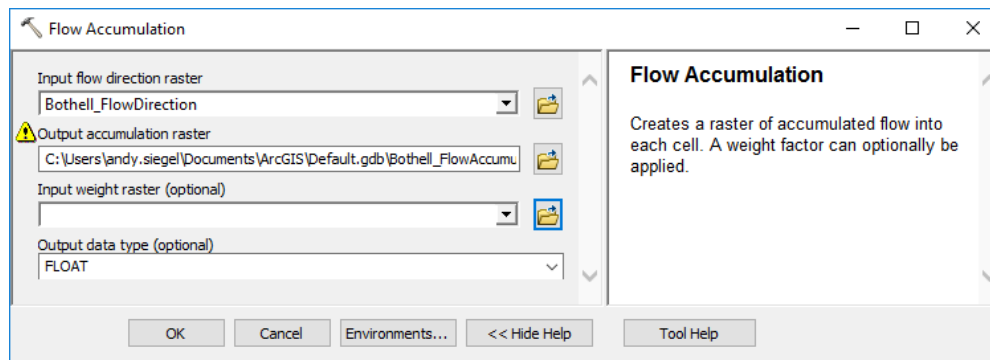
Flow direction

32	64	128
16		1
8	4	2

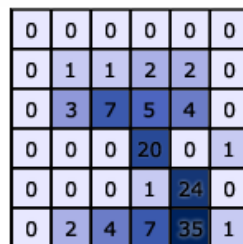
Direction coding



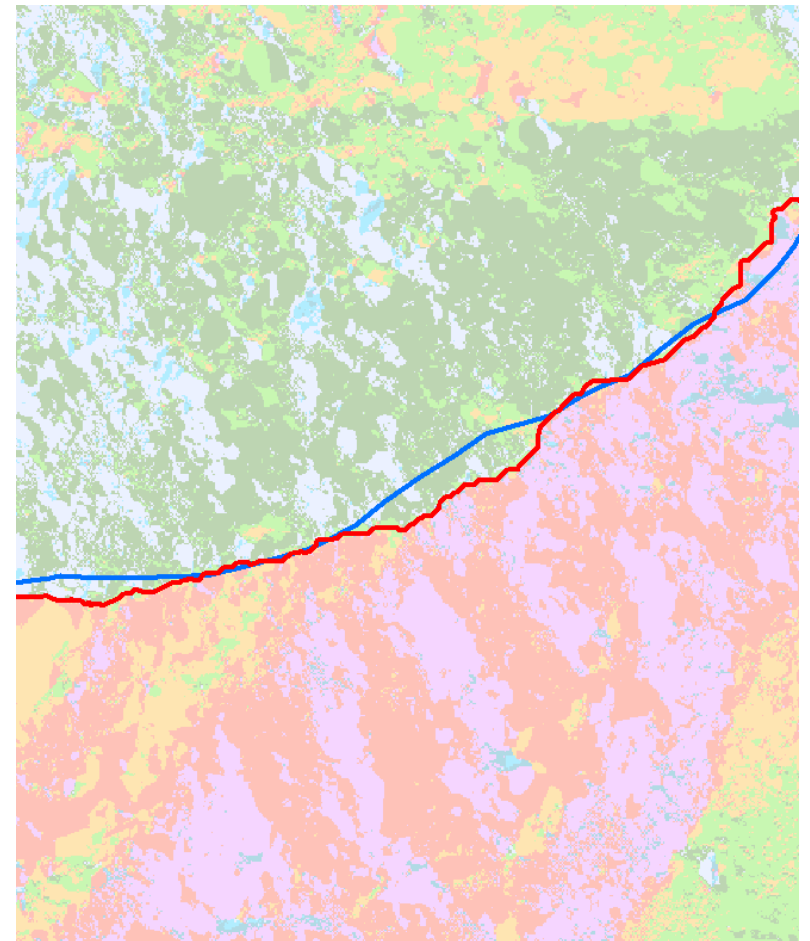
Hydro-corrections: Flow Accumulation



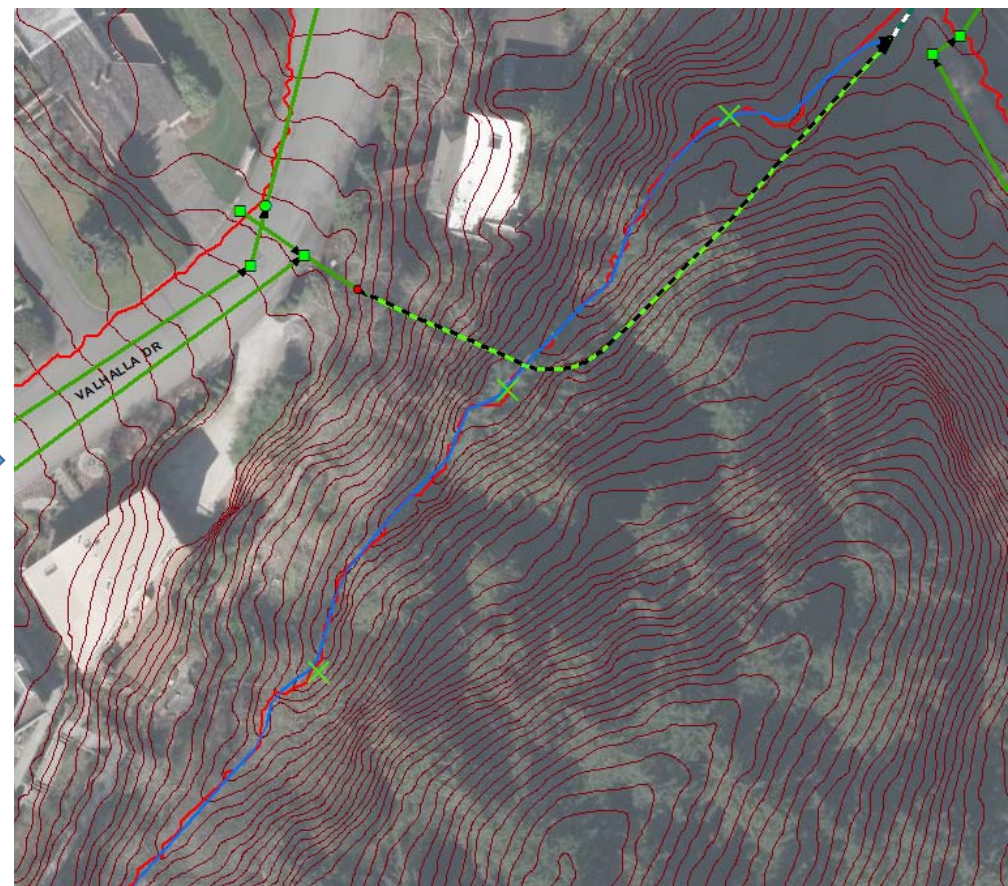
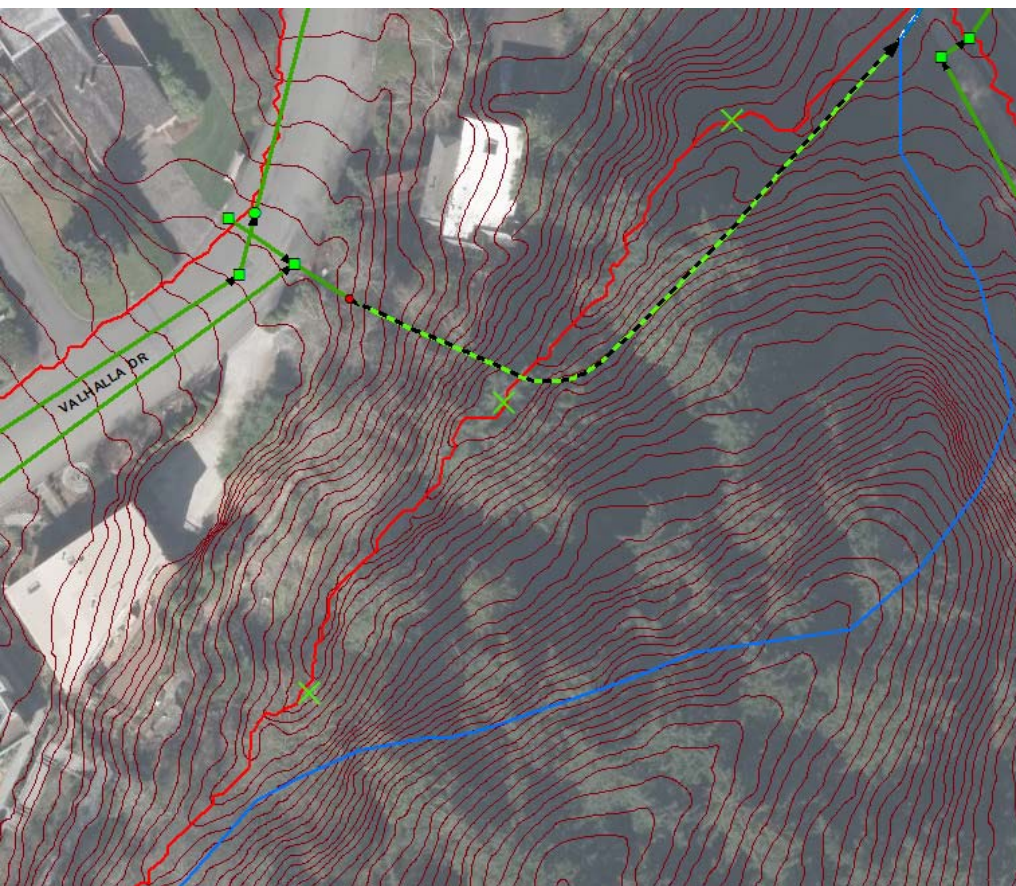
Flow direction



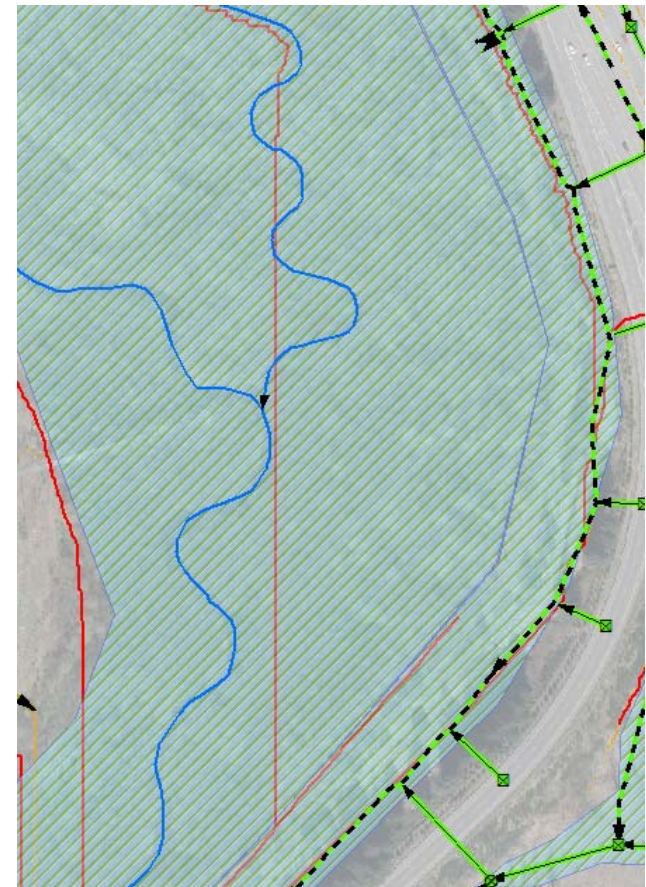
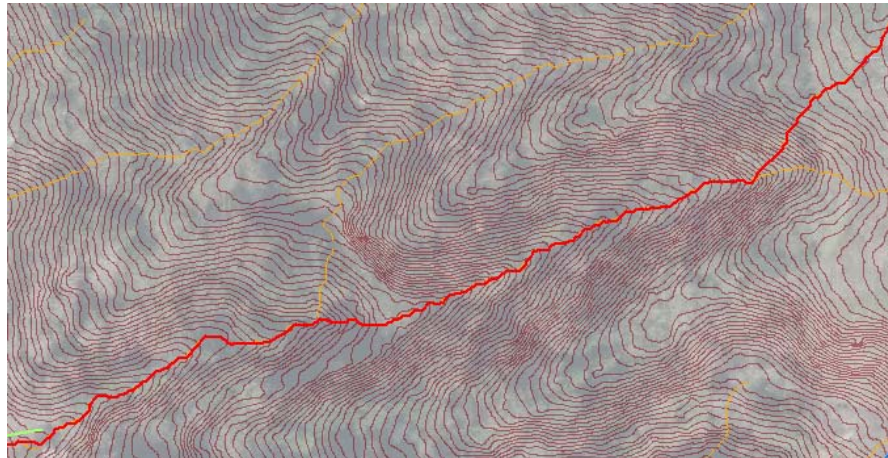
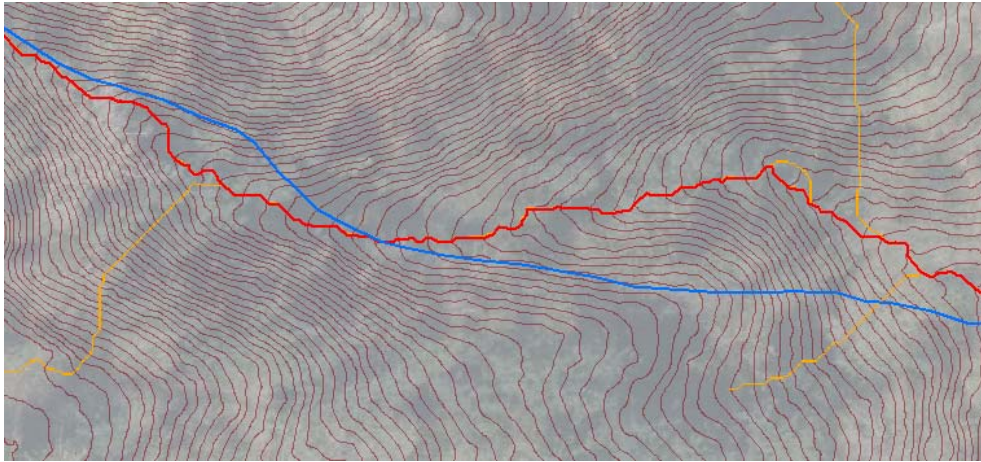
Flow accumulation



Case Study: Stream Hydro-corrections



Case Study: Stream Hydro-corrections



Questions?

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