Step-by-Step Tutorial for How to Operate the SICCM Toolbox

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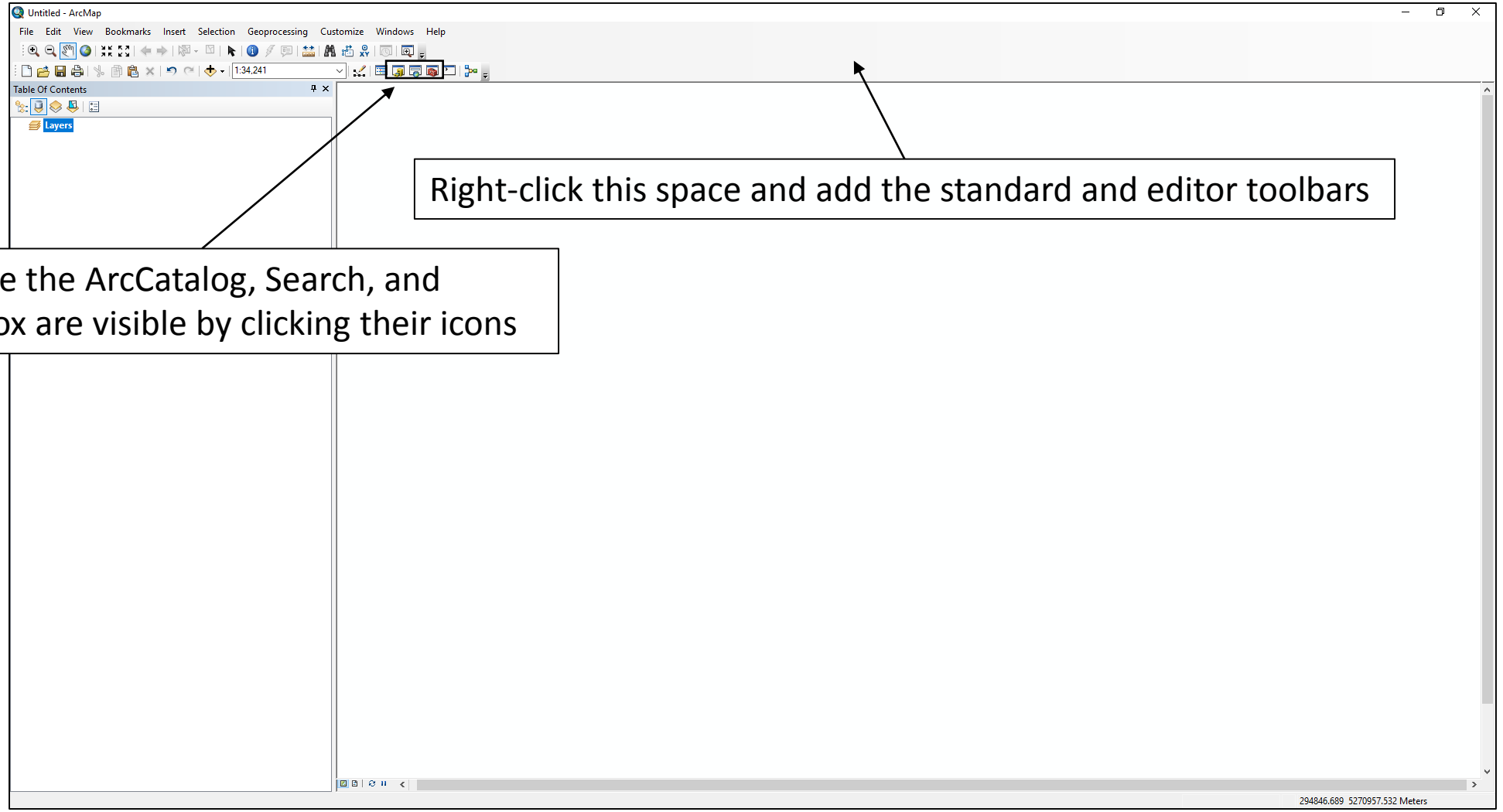
Introduction

- This slideshow illustrates how to implement the SICCM Toolbox
- The toolbox may be used to produce preliminary landslide inventory maps
- In order to perform the tutorial, you will need a computer with ArcGIS, version 10.3 or greater
- If you would like to know more about the SICCM Toolbox, please read the ***Guide to Operation of the Scarp Identification+Contour Connection Method (SICCM) ArcGIS Toolbox***

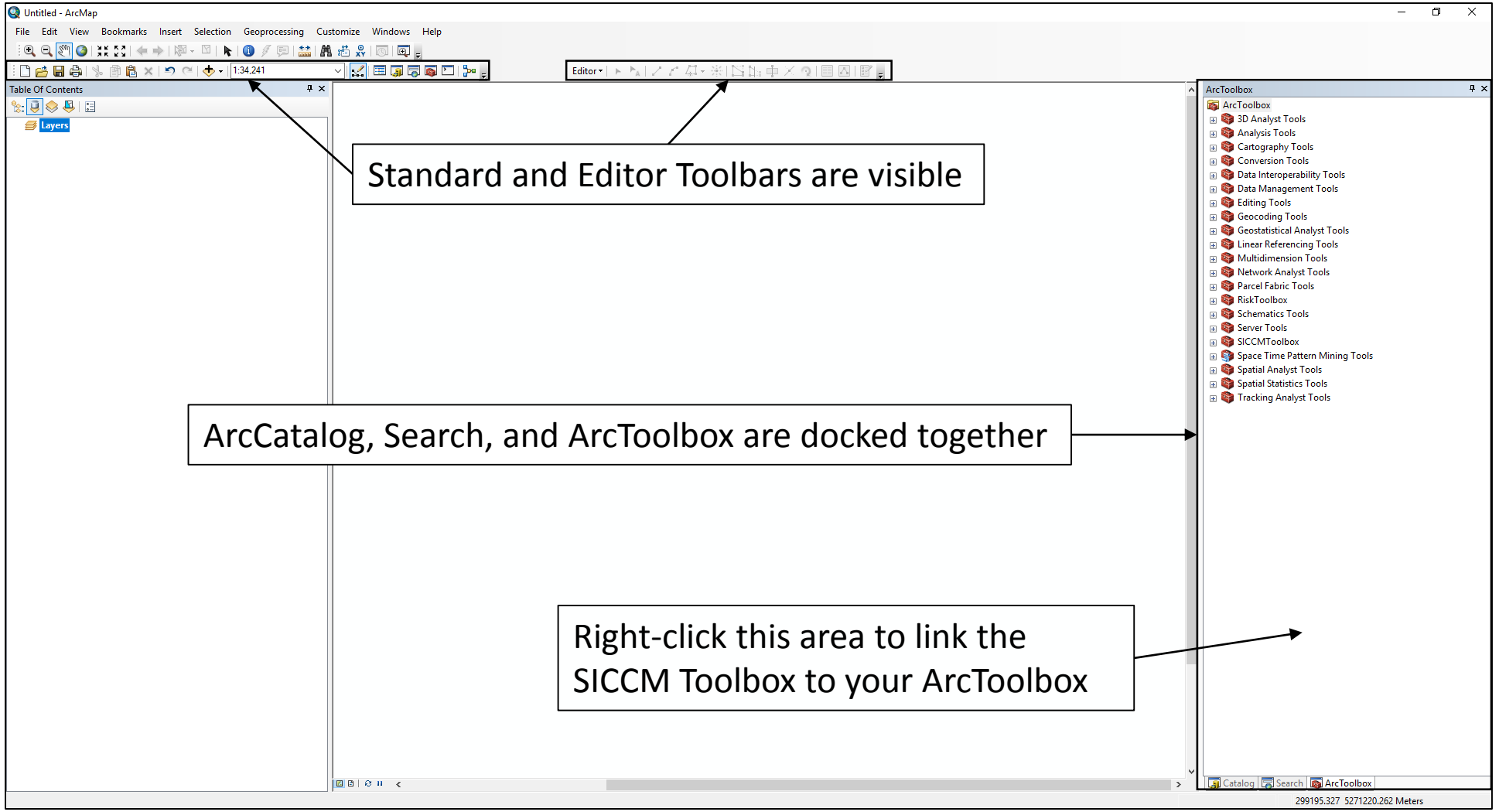
Familiarize yourself with ArcMap



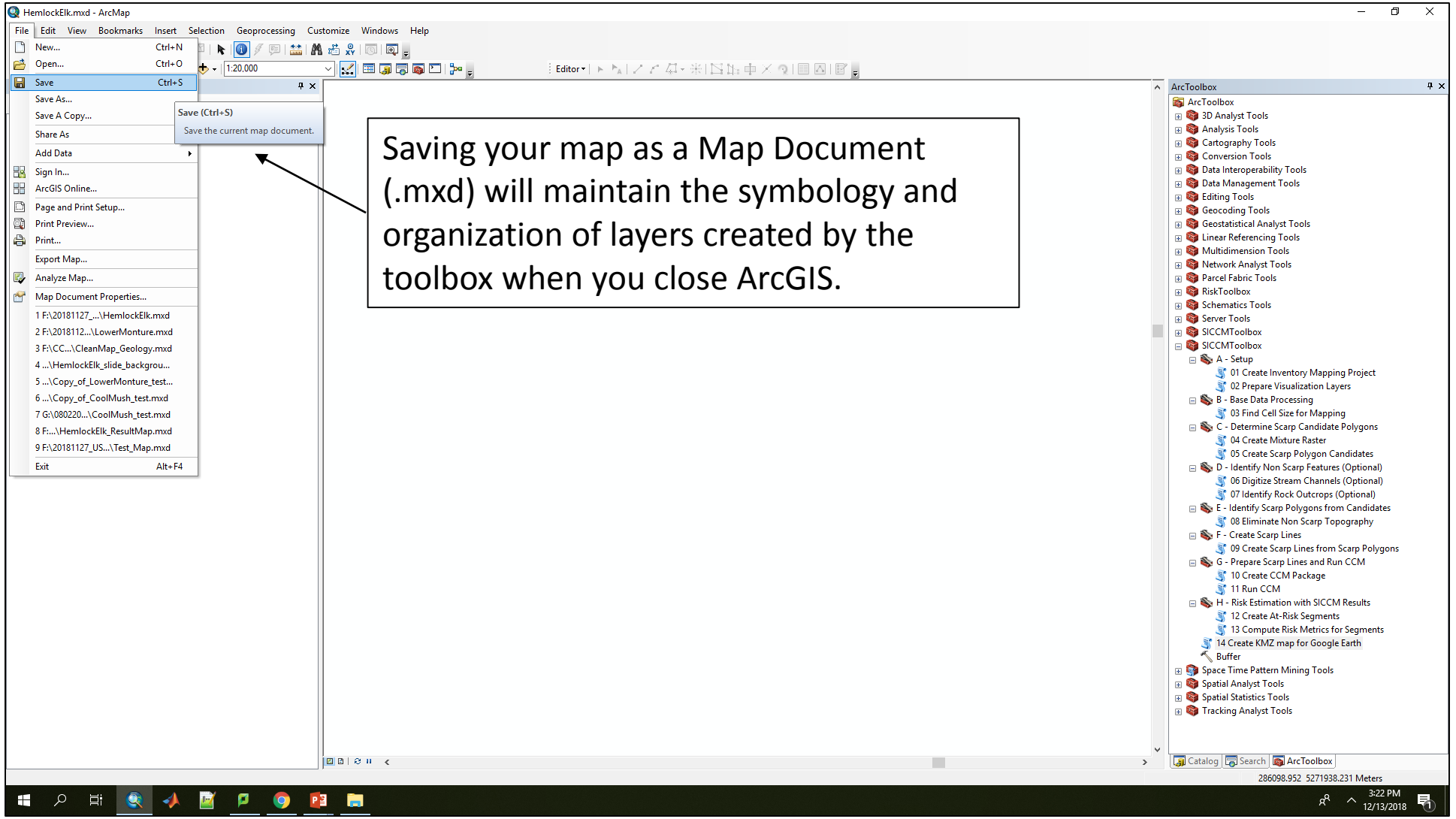
Right-click this space and add the standard and editor toolbars

Make sure the ArcCatalog, Search, and ArcToolbox are visible by clicking their icons

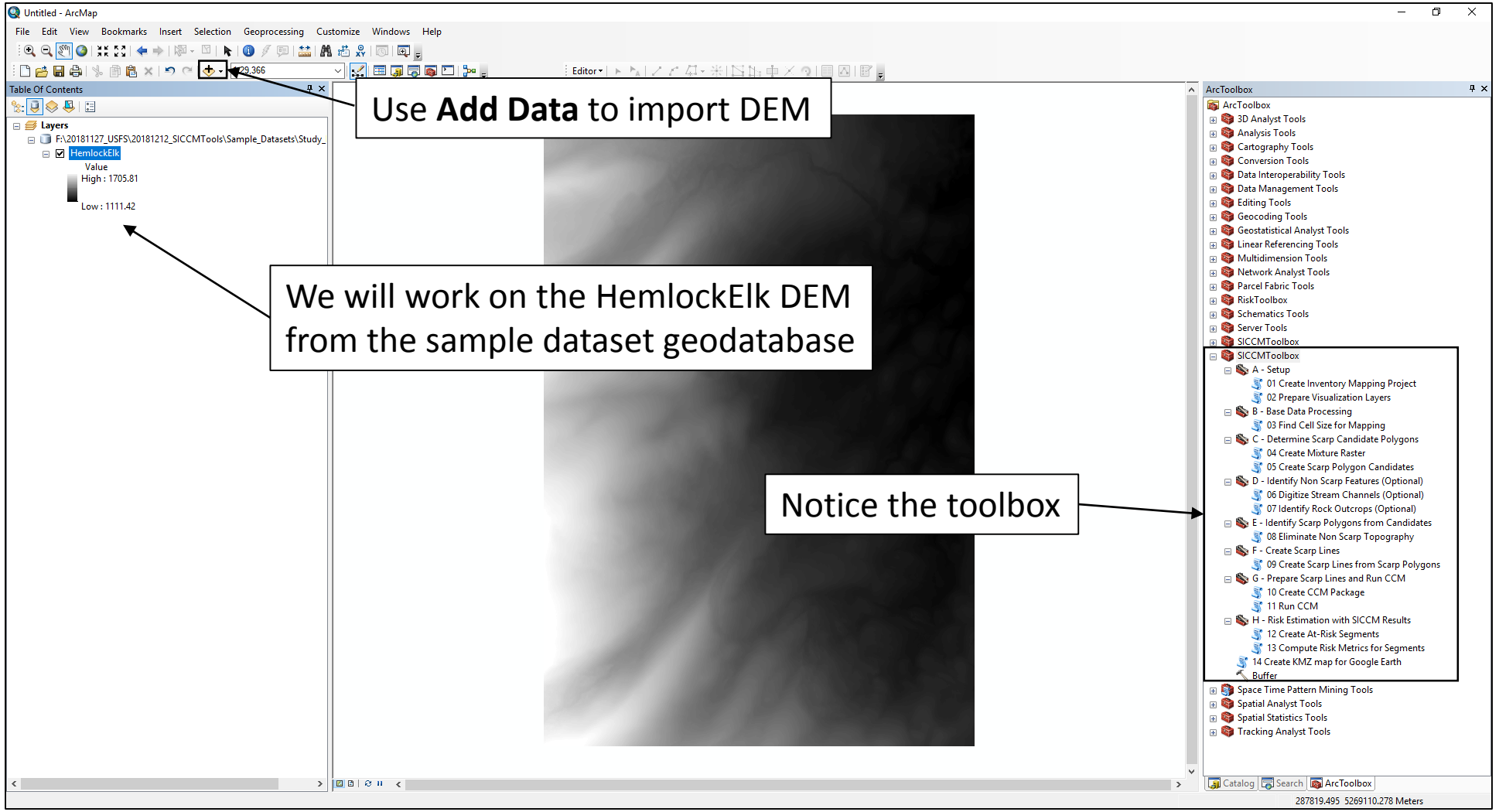
ArcMap should look something like this



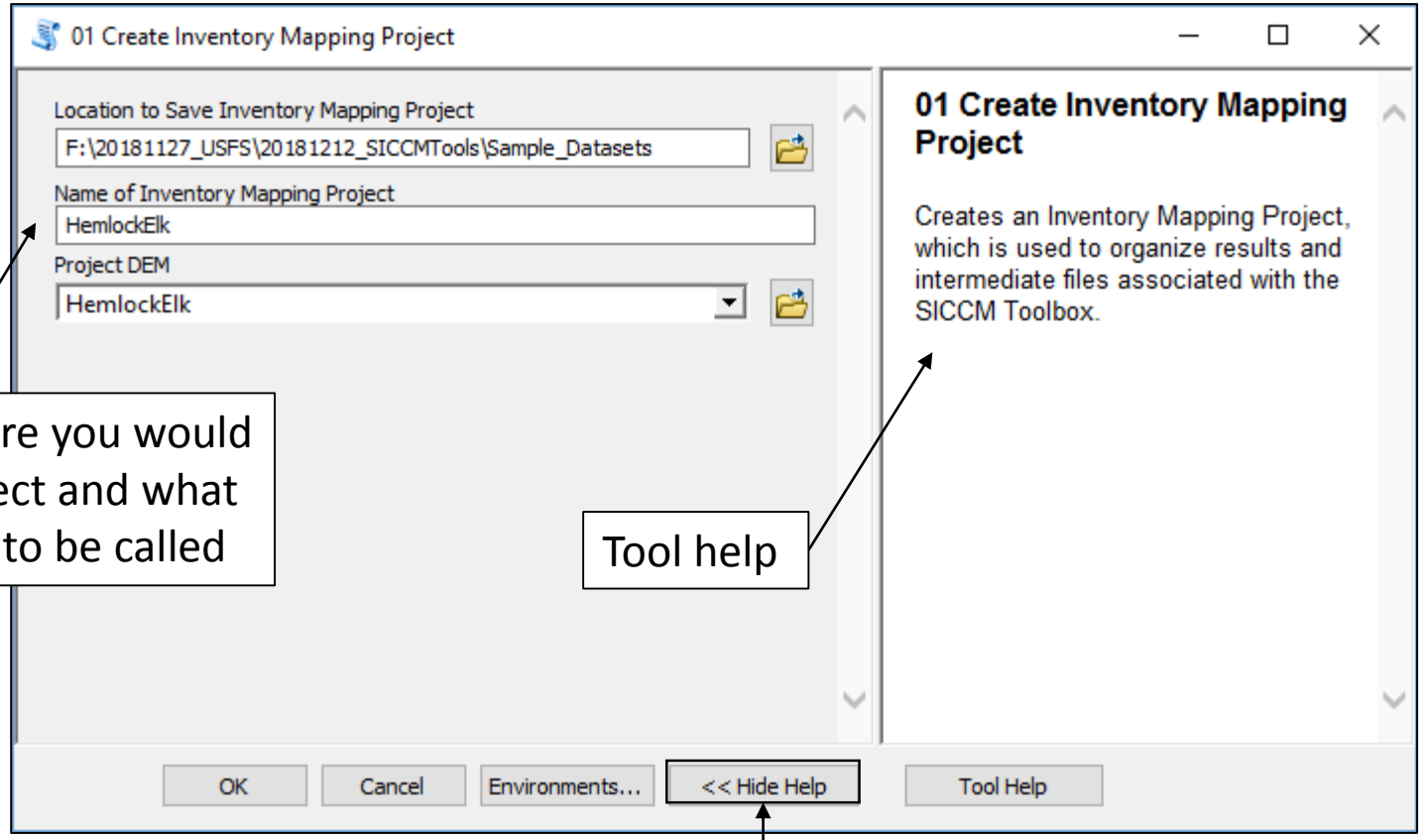
Save your Map Document



Add your DEM to the map



Run Tool 1

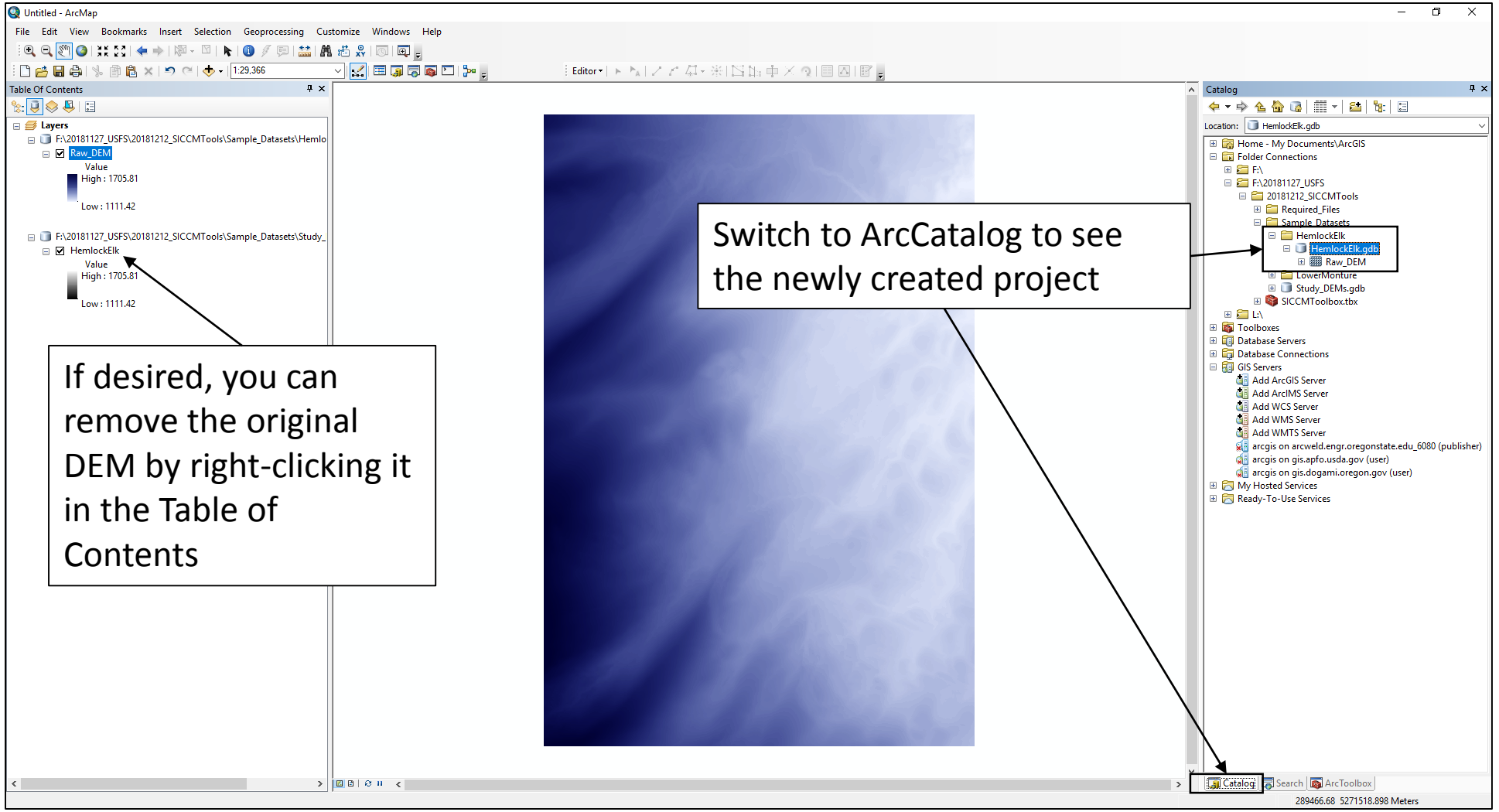


You can choose where you would like to save the project and what you would like for it to be called

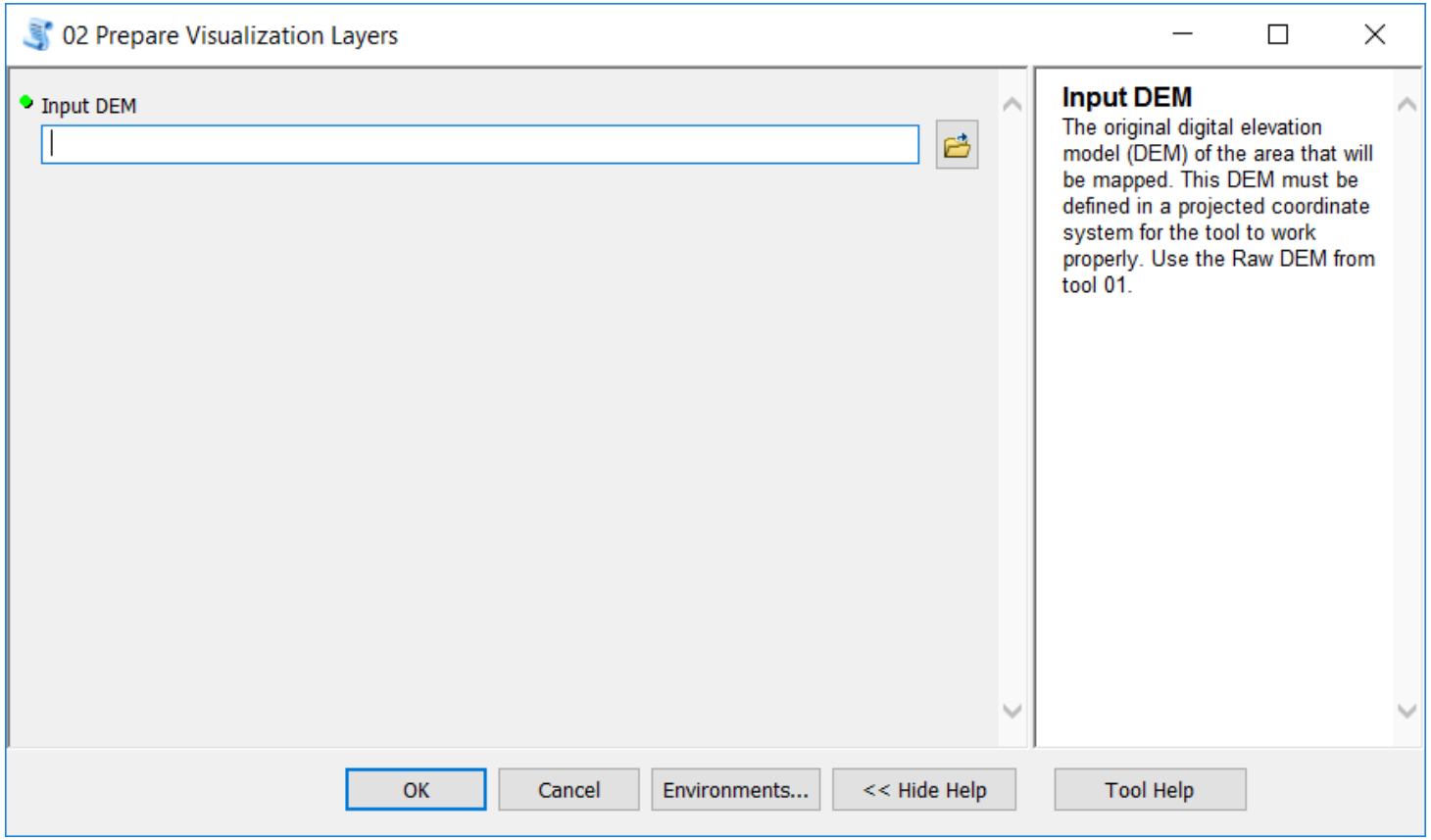
Tool help

Toggle tool help visibility

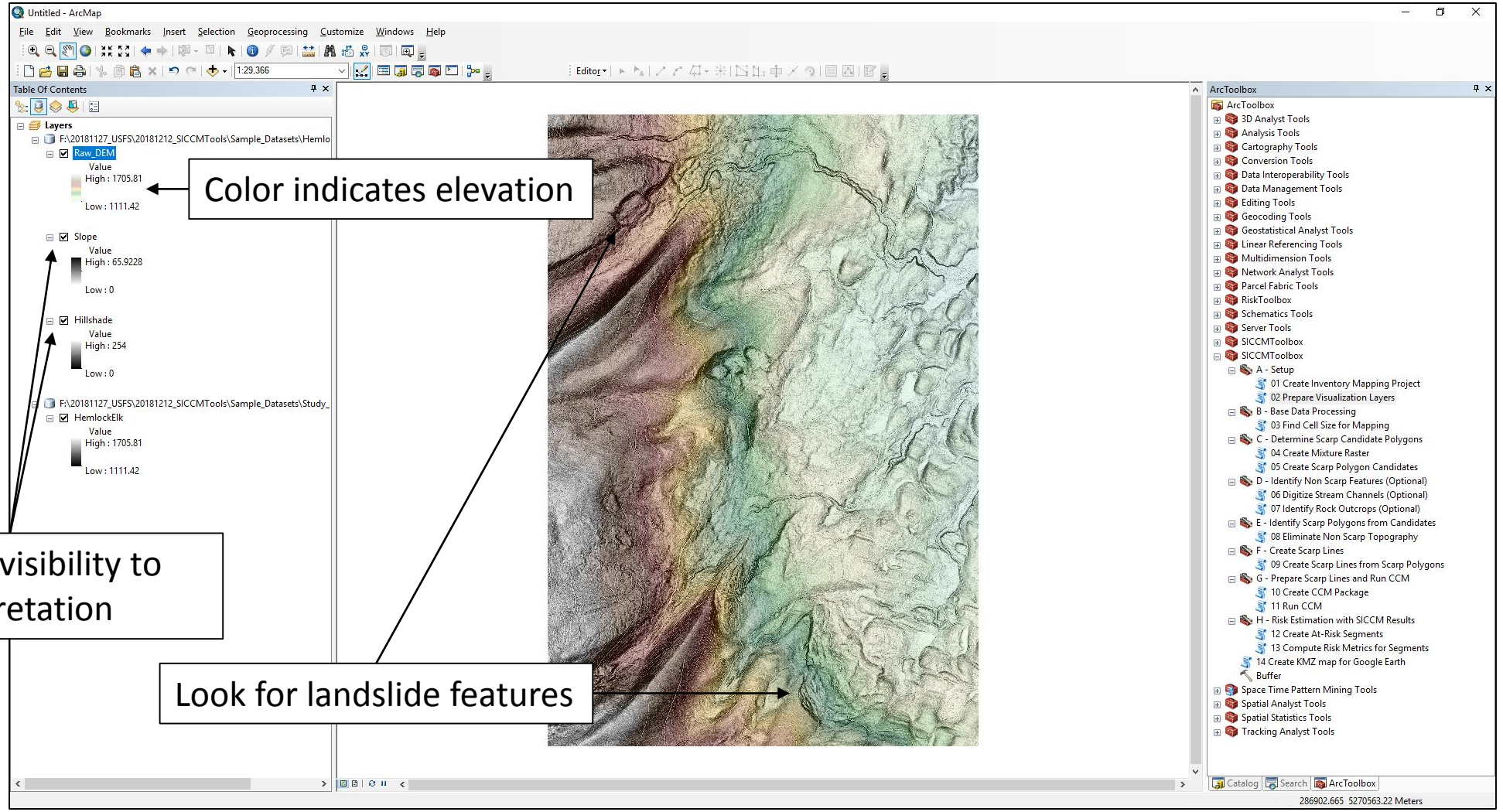
Output of Tool 1



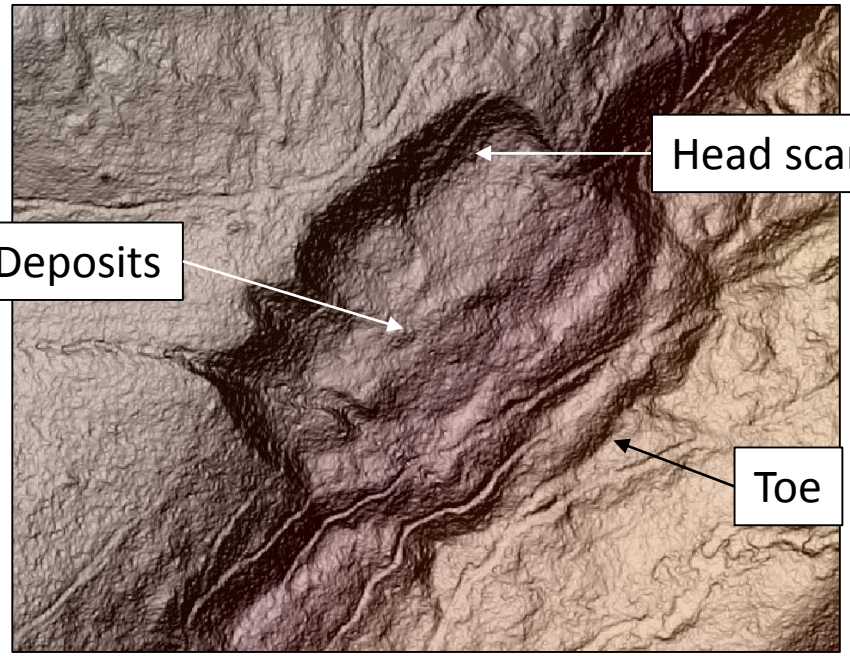
Run Tool 2

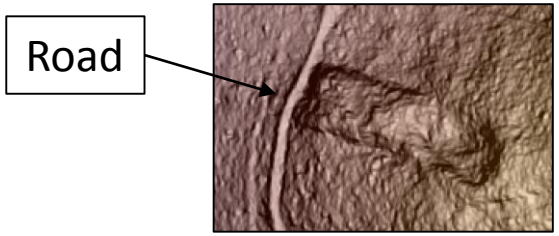

02 Prepare Visualization Layers
Input DEM
Input DEM
The original digital elevation model (DEM) of the area that will be mapped. This DEM must be defined in a projected coordinate system for the tool to work properly. Use the Raw DEM from tool 01.
OK
Cancel
Environments...
<< Hide Help
Tool Help

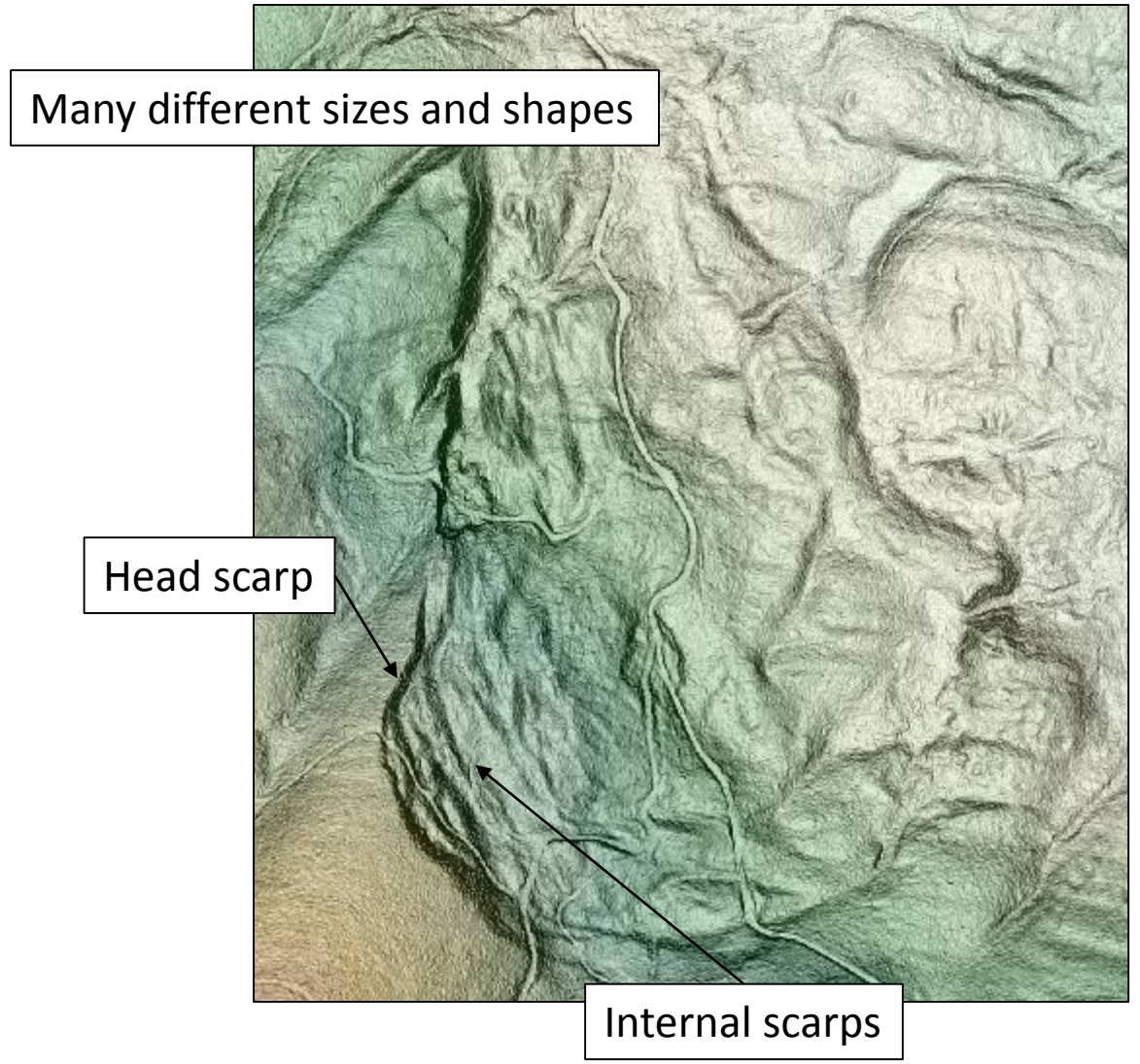
Output of Tool 2



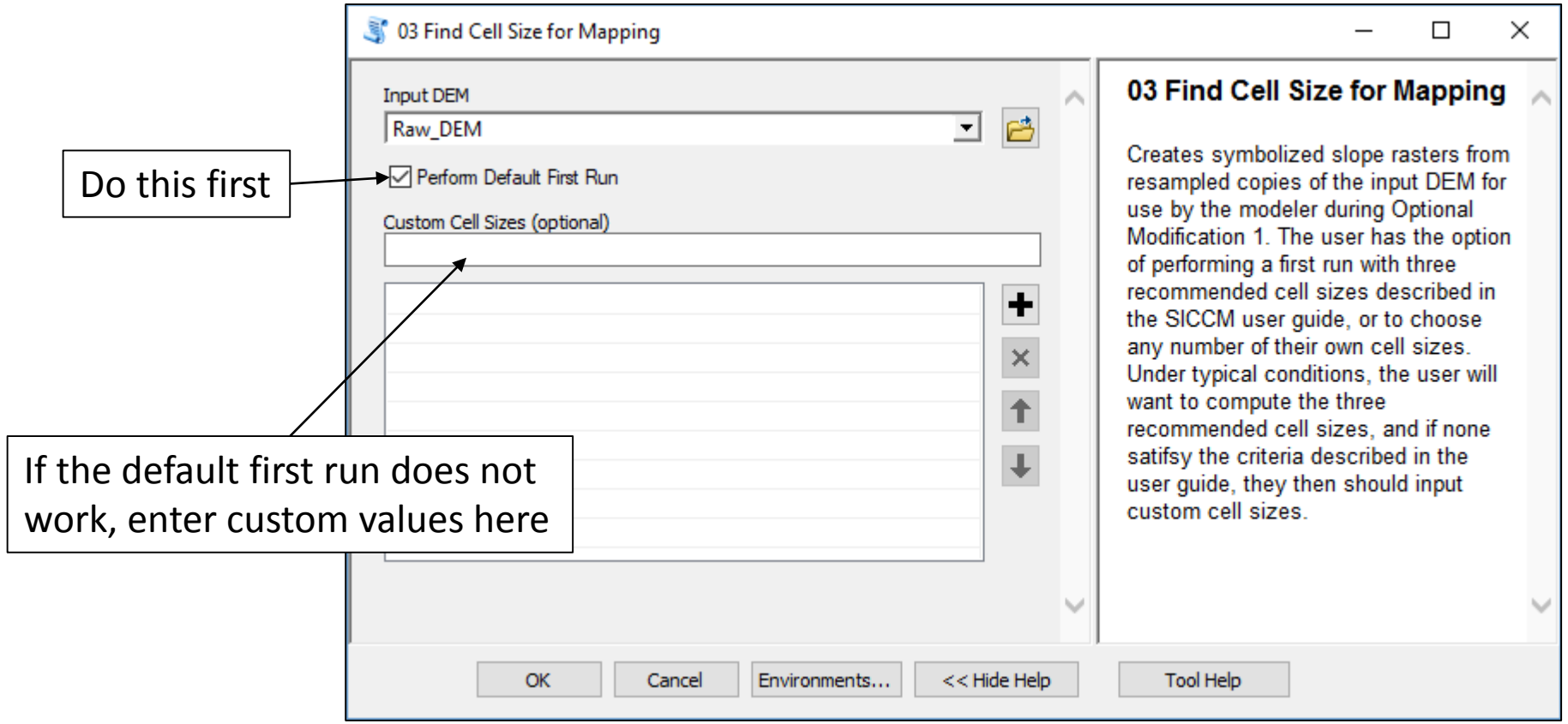
Some landslide features visible in the terrain



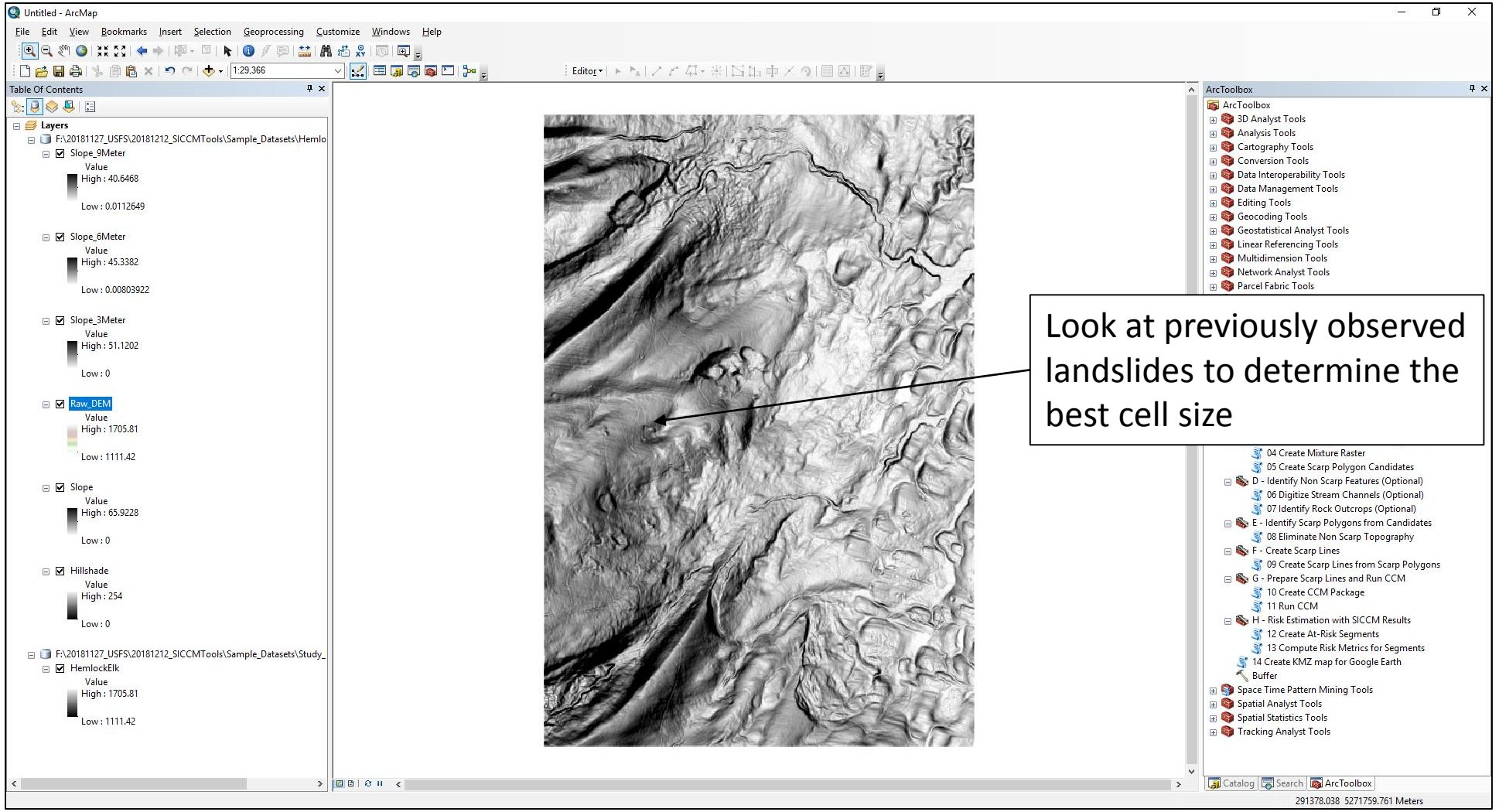




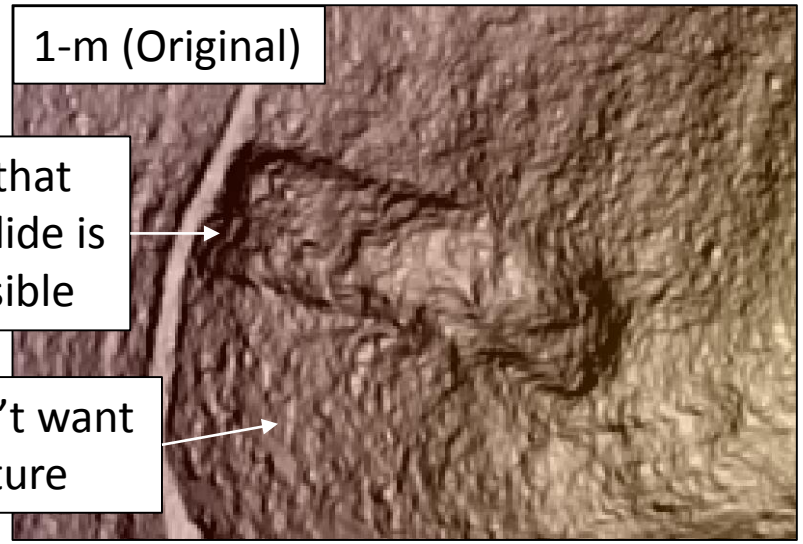
Run Tool 3

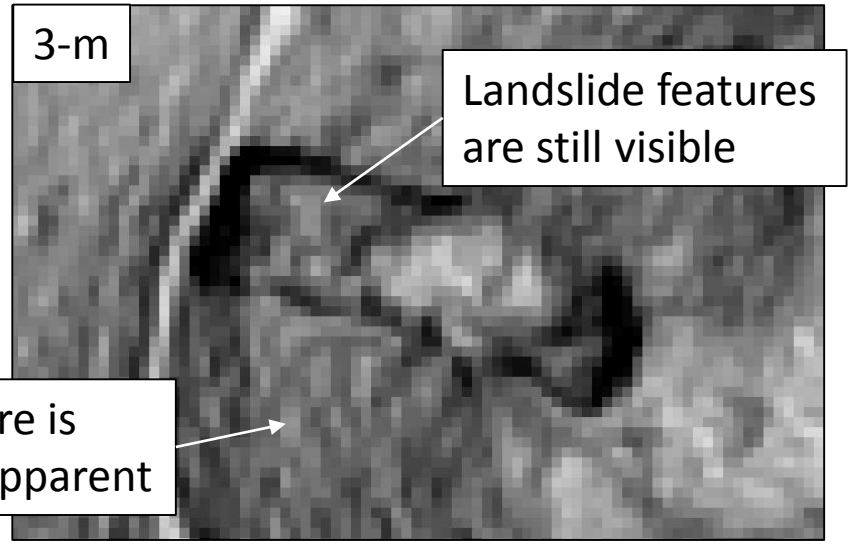

Do this first
If the default first run does not work, enter custom values here
03 Find Cell Size for Mapping
Input DEM
Raw_DEM
Perform Default First Run
Custom Cell Sizes (optional)
03 Find Cell Size for Mapping
Creates symbolized slope rasters from resampled copies of the input DEM for use by the modeler during Optional Modification 1. The user has the option of performing a first run with three recommended cell sizes described in the SICCM user guide, or to choose any number of their own cell sizes. Under typical conditions, the user will want to compute the three recommended cell sizes, and if none satifsy the criteria described in the user guide, they then should input custom cell sizes.
OK
Cancel
Environments...
<< Hide Help
Tool Help

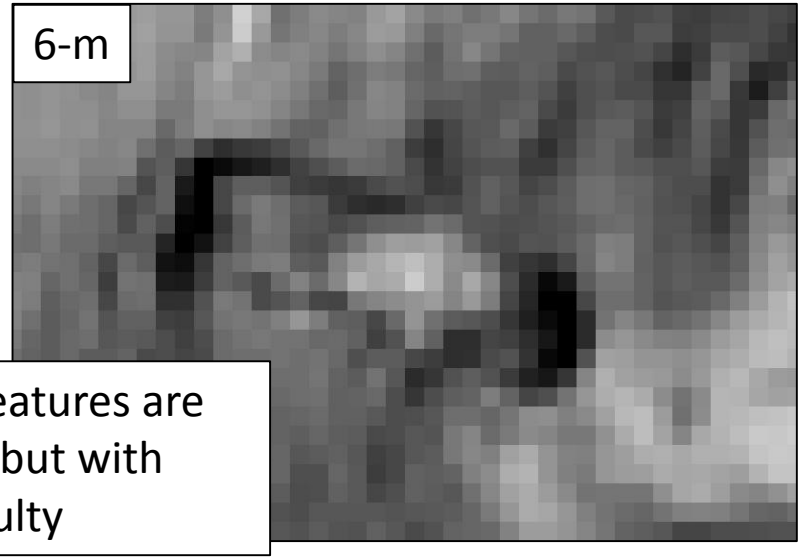
Output of Tool 3

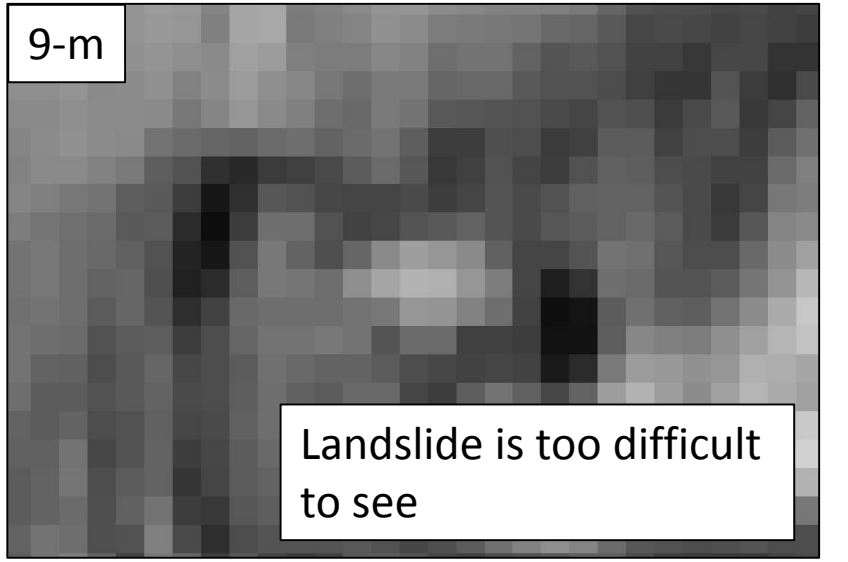


Comparing cell sizes

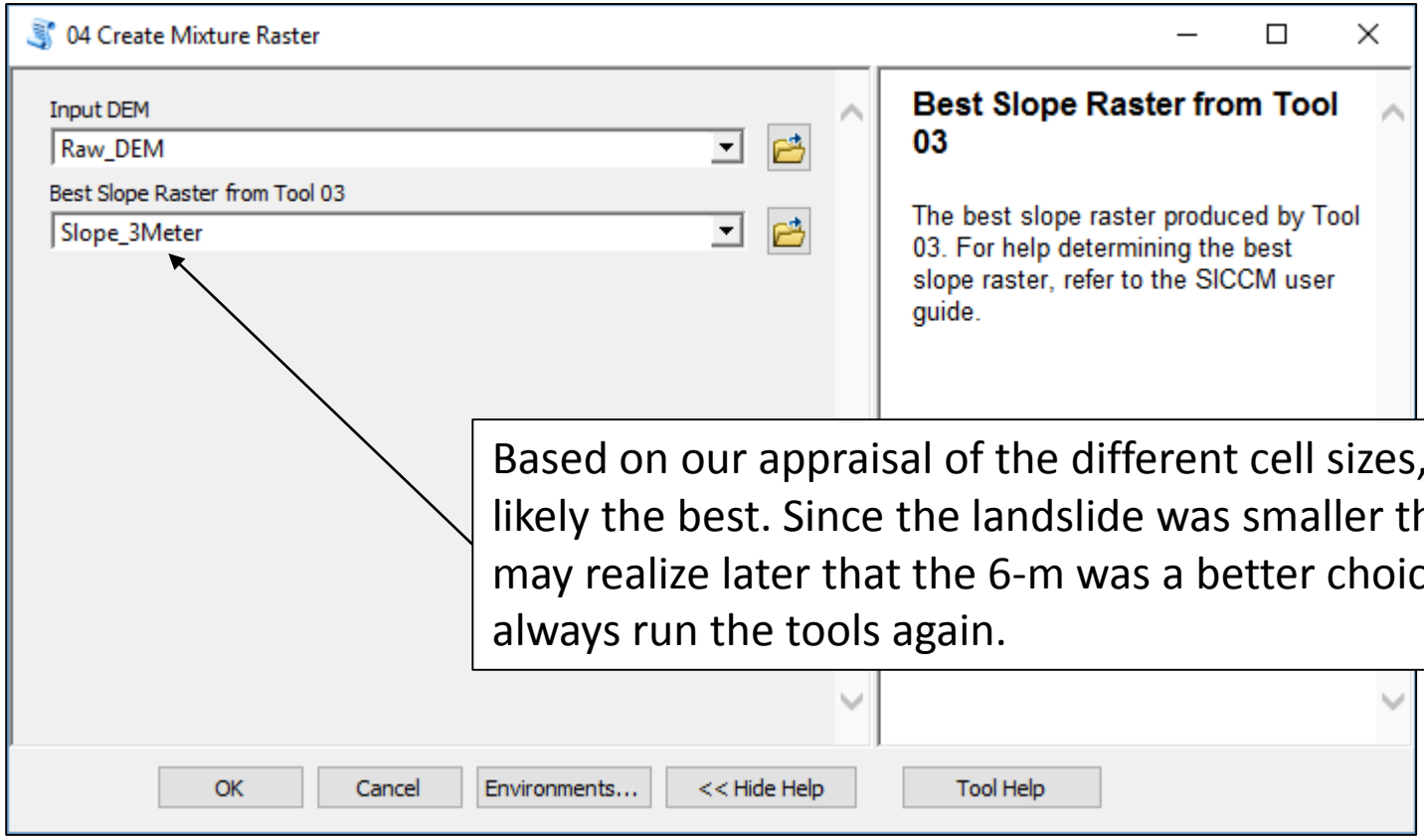






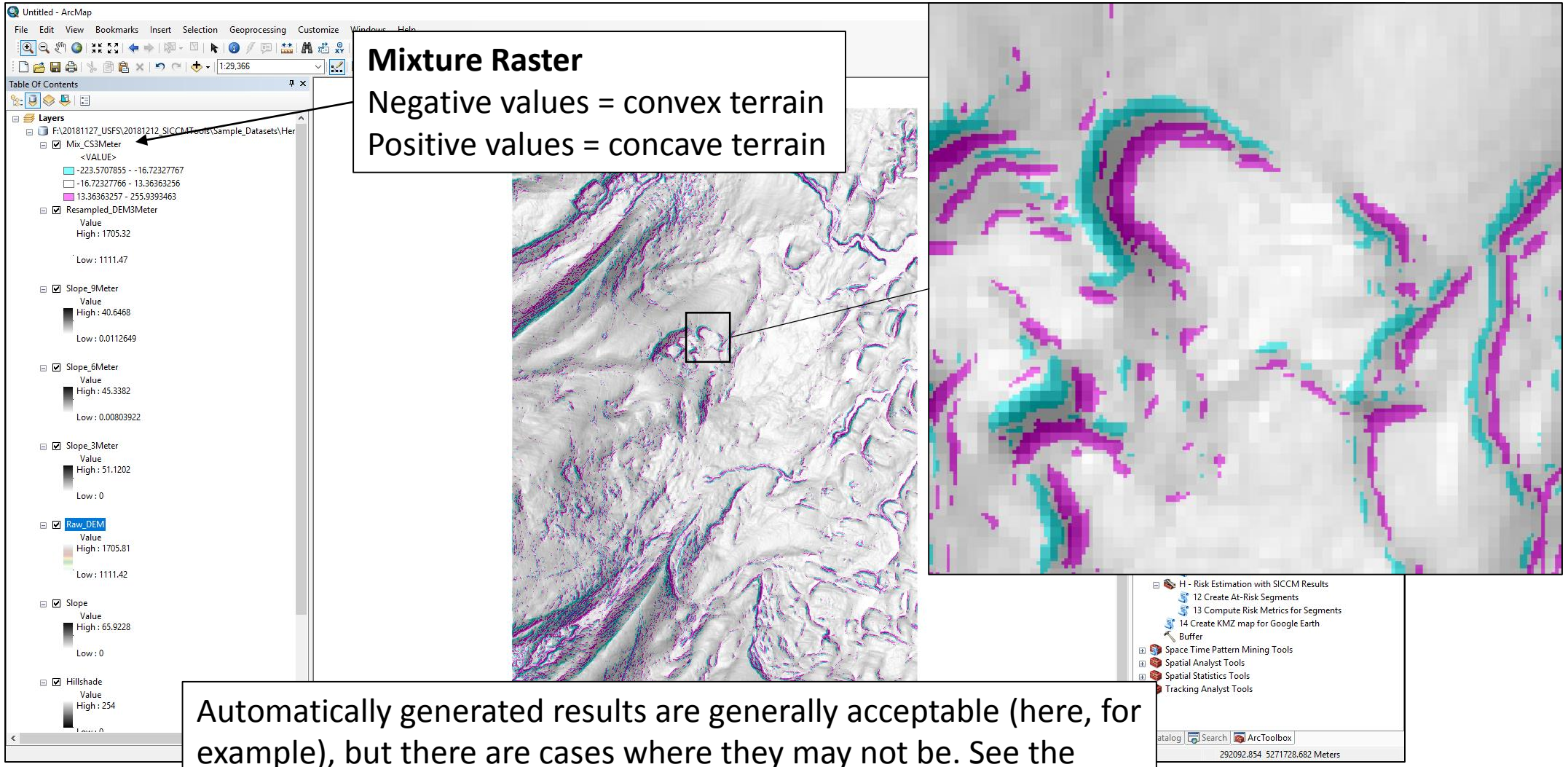


Run Tool 4



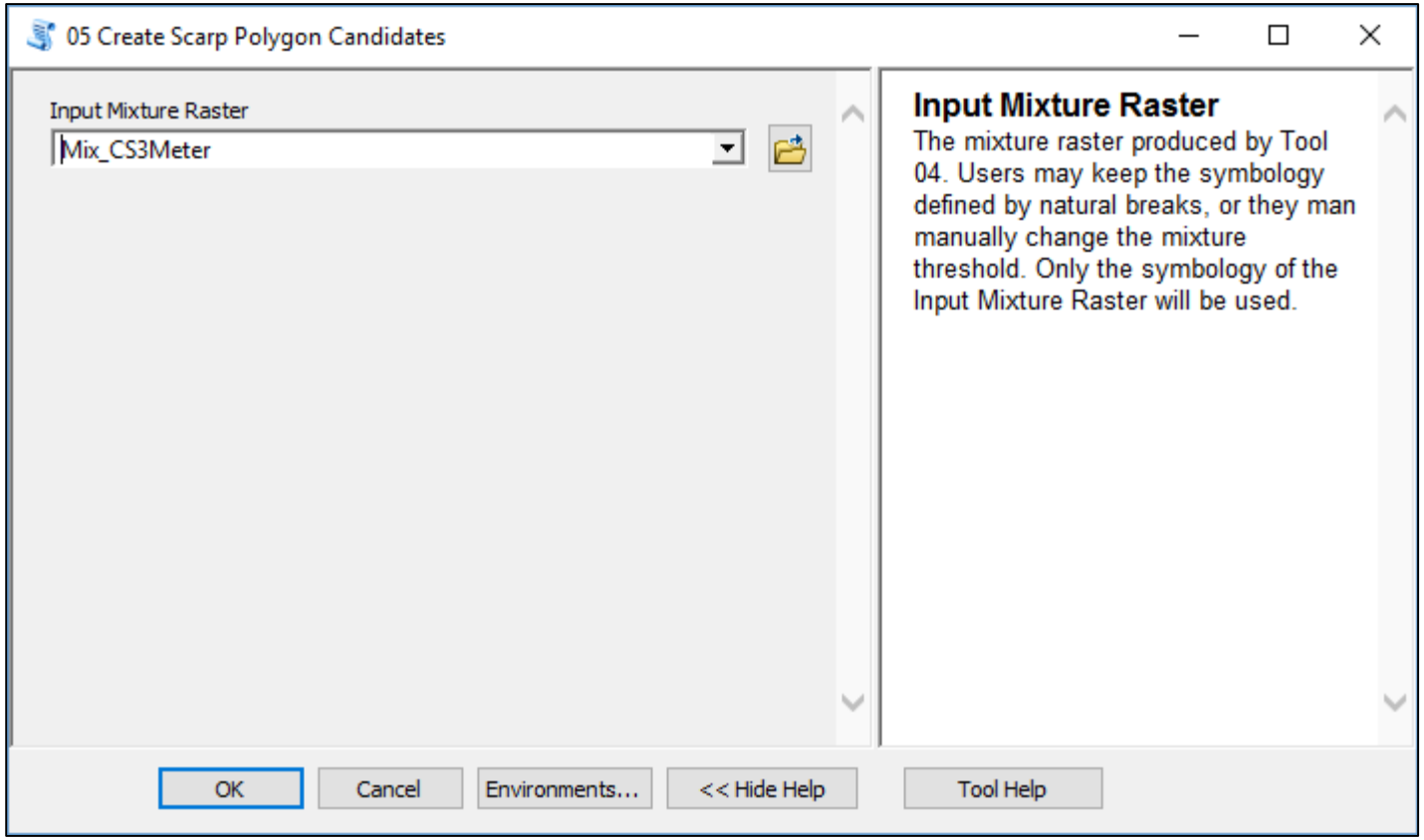
Based on our appraisal of the different cell sizes, the 3-m was likely the best. Since the landslide was smaller than most, we may realize later that the 6-m was a better choice – you can always run the tools again.

Output of Tool 4

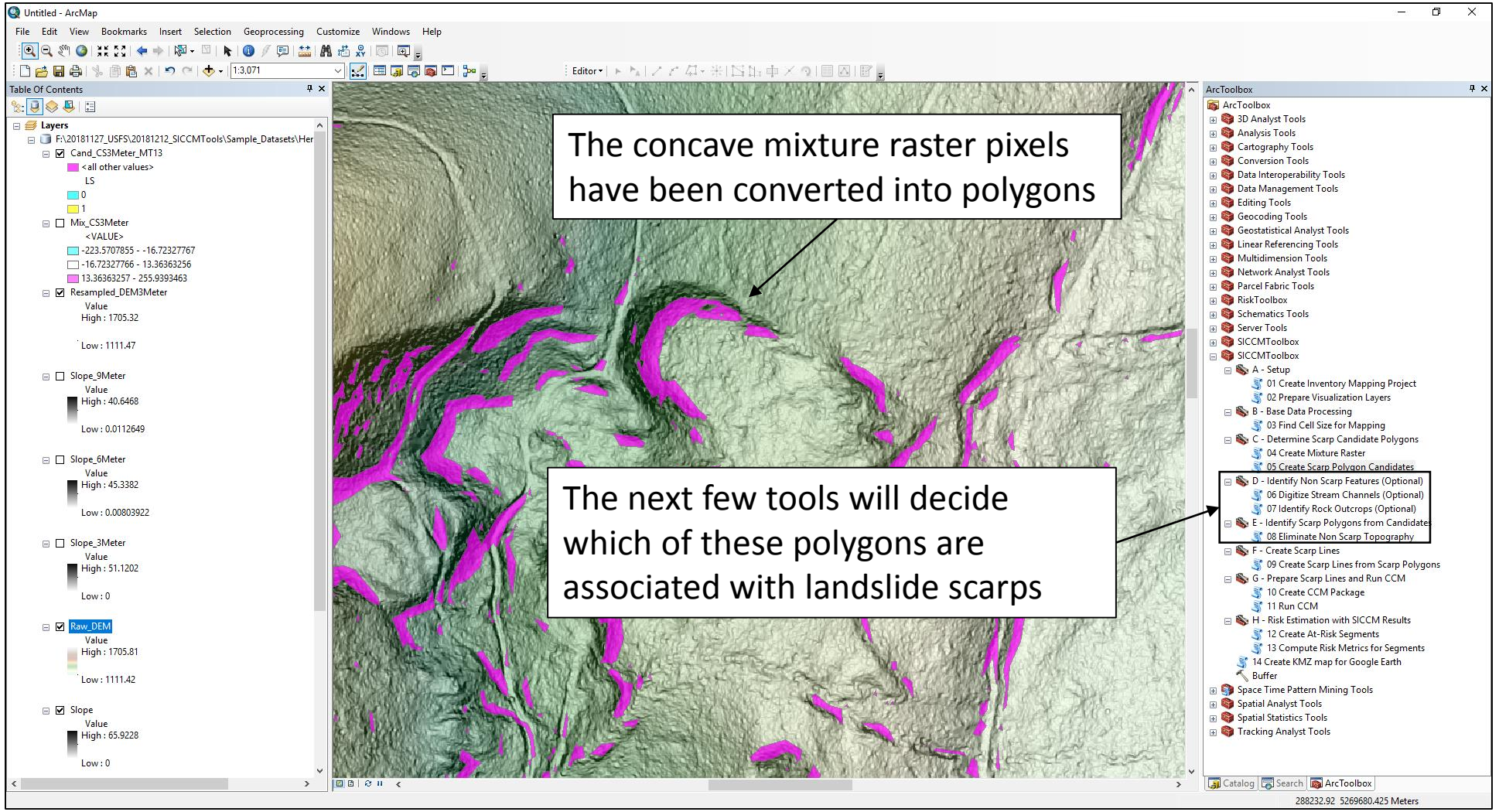


Automatically generated results are generally acceptable (here, for example), but there are cases where they may not be. See the User Guide for more information regarding the special cases

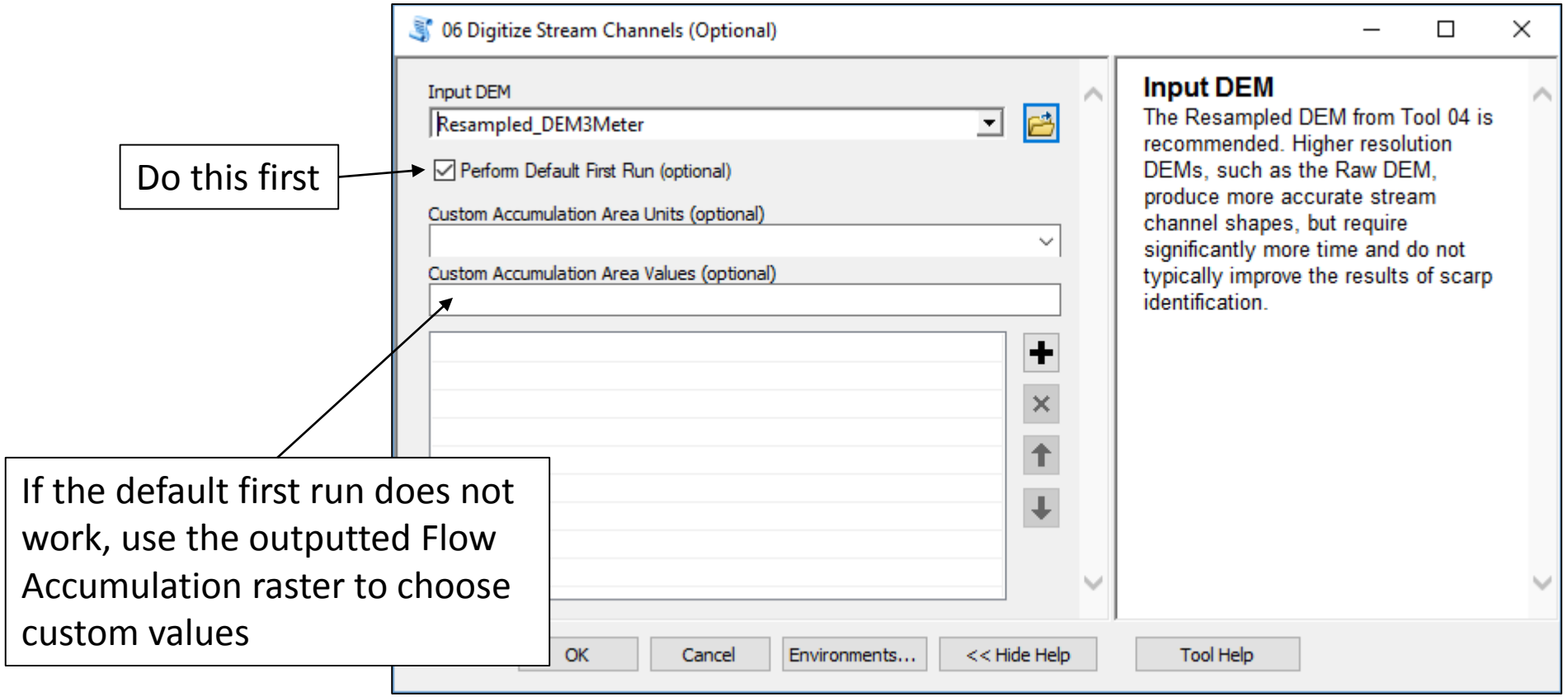
Run Tool 5


05 Create Scarp Polygon Candidates
Input Mixture Raster
Mix_CS3Meter
Input Mixture Raster
The mixture raster produced by Tool 04. Users may keep the symbology defined by natural breaks, or they man manually change the mixture threshold. Only the symbology of the Input Mixture Raster will be used.
OK
Cancel
Environments...
<< Hide Help
Tool Help

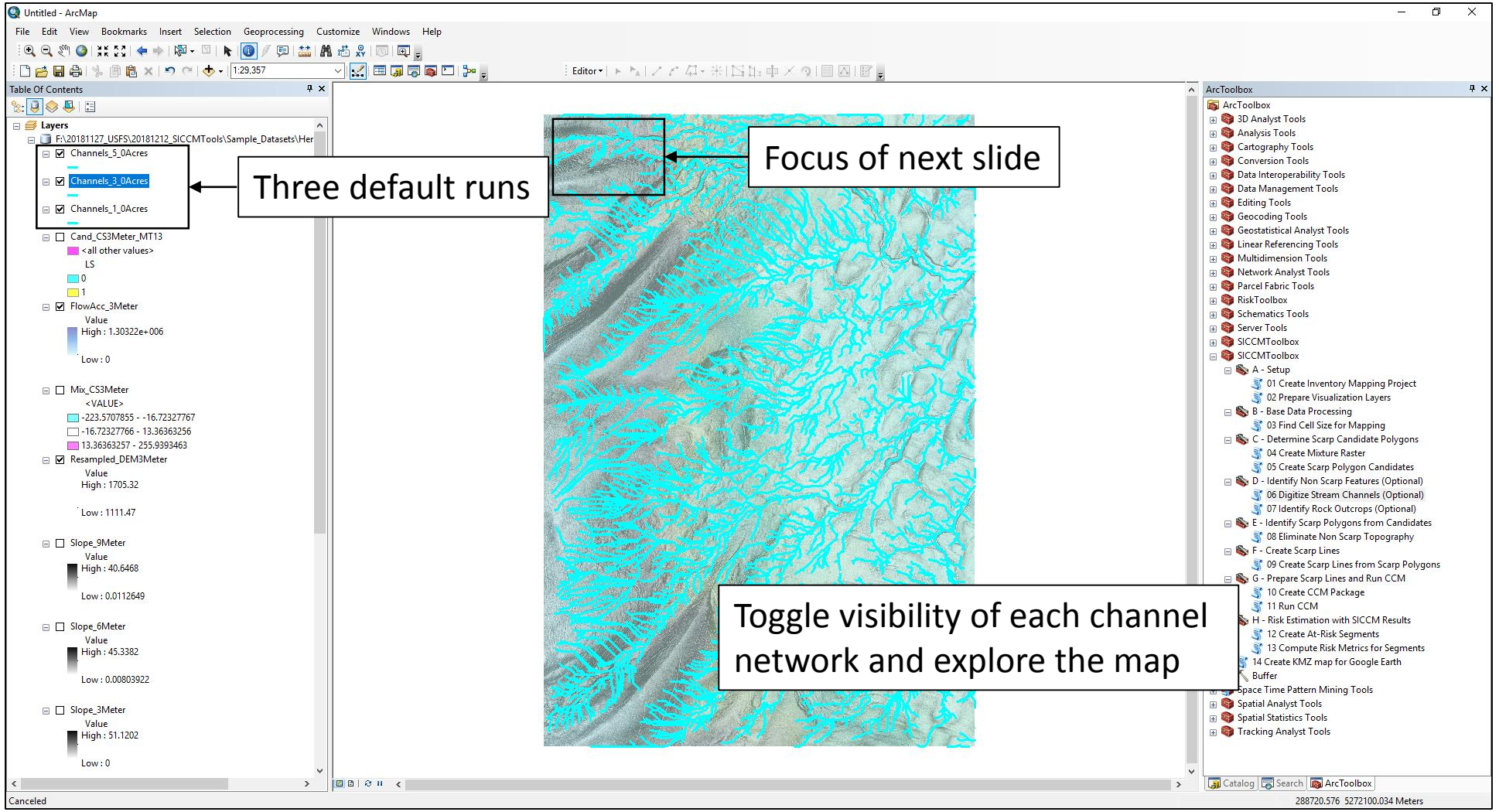
Results of Tool 5



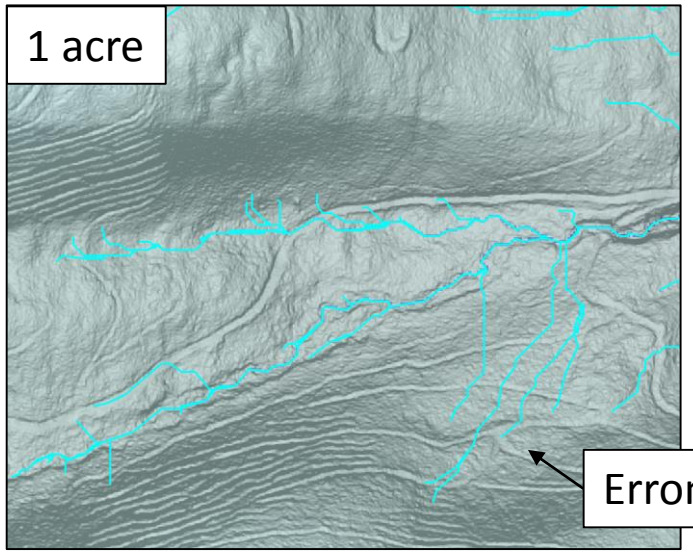
Run Tool 6

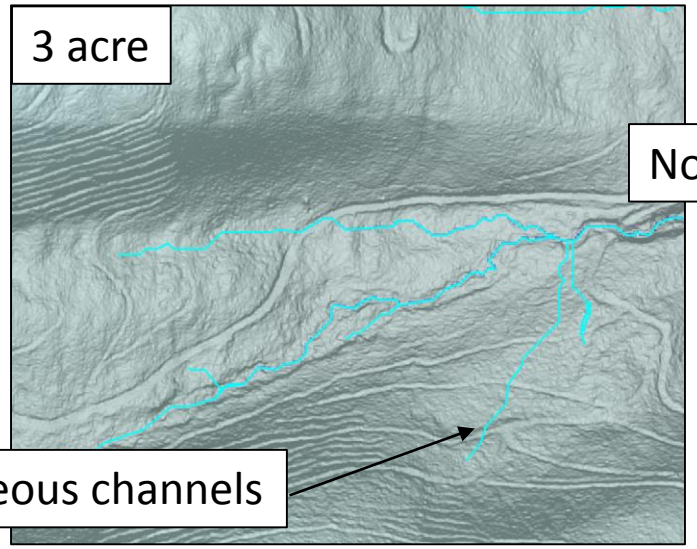

Do this first
If the default first run does not work, use the outputted Flow Accumulation raster to choose custom values
06 Digitize Stream Channels (Optional)
Input DEM
Resampled_DEM3Meter
Perform Default First Run (optional)
Custom Accumulation Area Units (optional)
Custom Accumulation Area Values (optional)
Input DEM
The Resampled DEM from Tool 04 is recommended. Higher resolution DEMs, such as the Raw DEM, produce more accurate stream channel shapes, but require significantly more time and do not typically improve the results of scarp identification.
OK
Cancel
Environments...
<< Hide Help
Tool Help

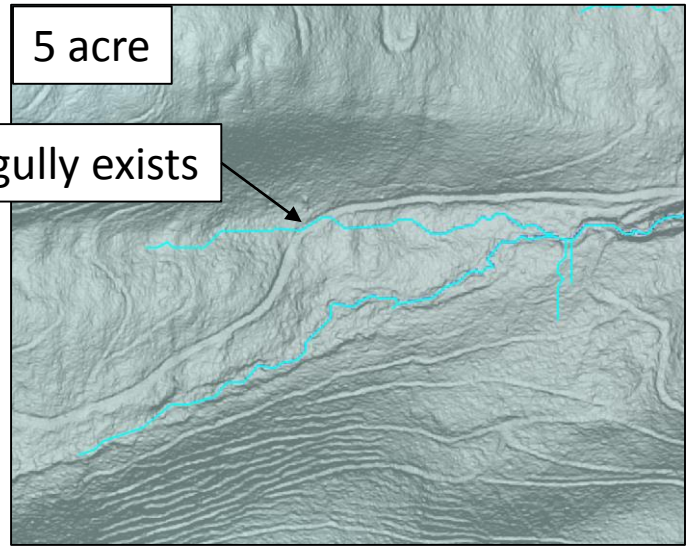
Output of Tool 6



Comparison of channel networks





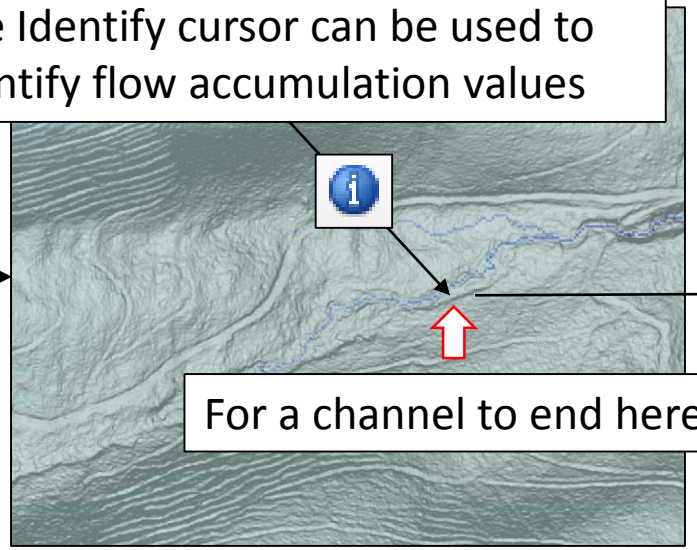


No gully exists

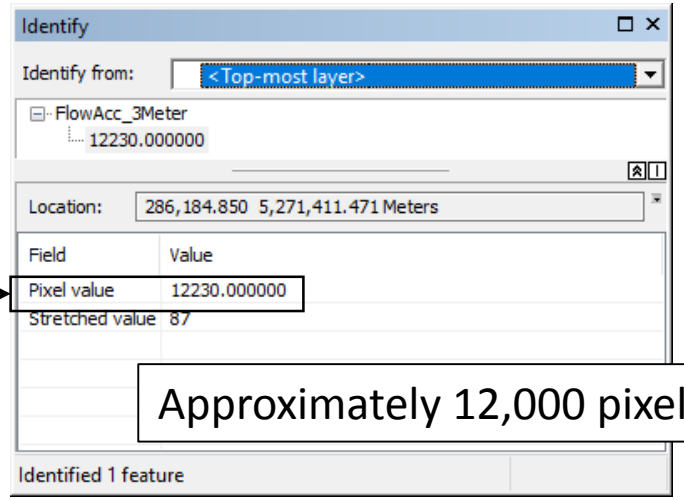
Erroneous channels

All accumulation areas seem to be too small, so we need to choose a new value from the Flow Accumulation Raster

The Identify cursor can be used to identify flow accumulation values

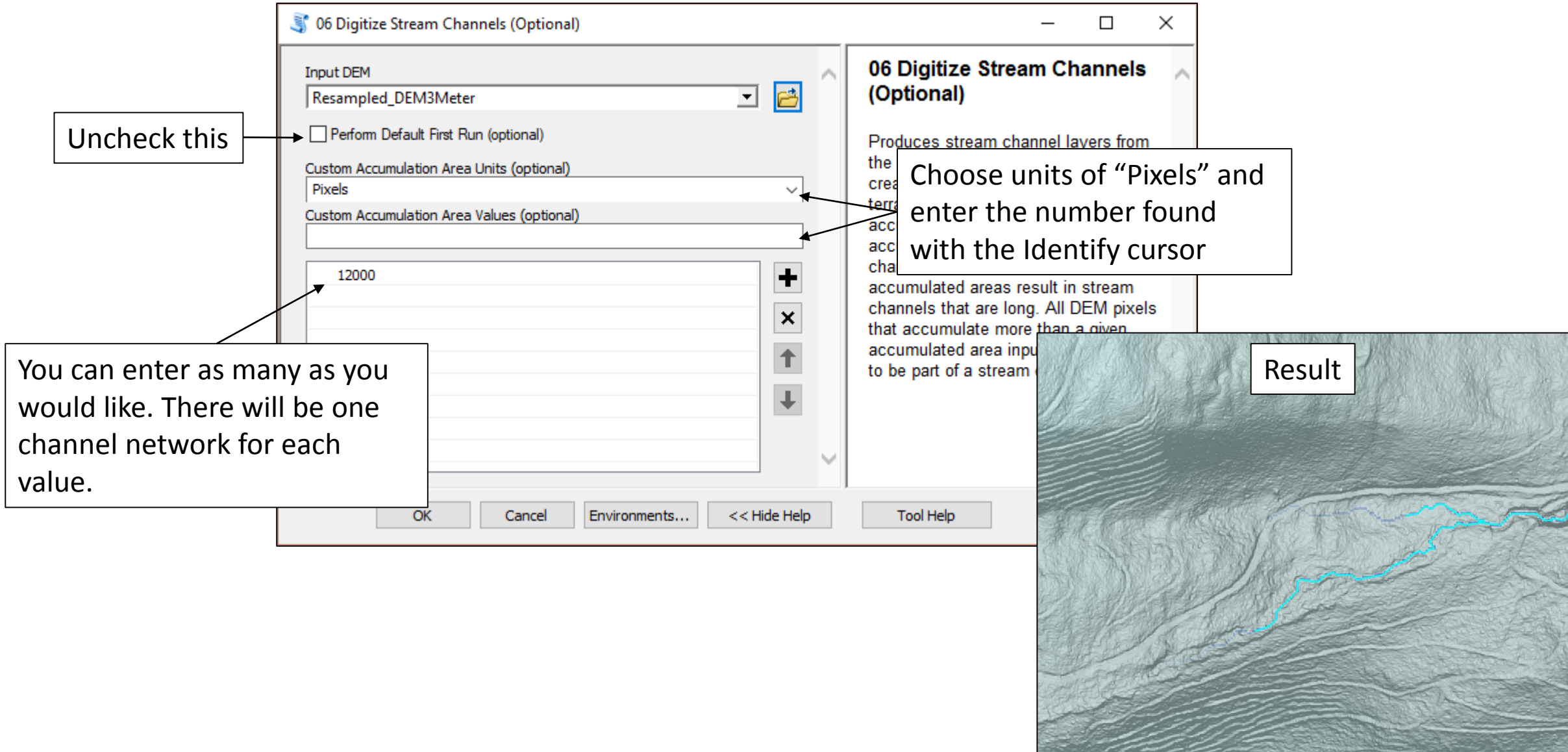


For a channel to end here

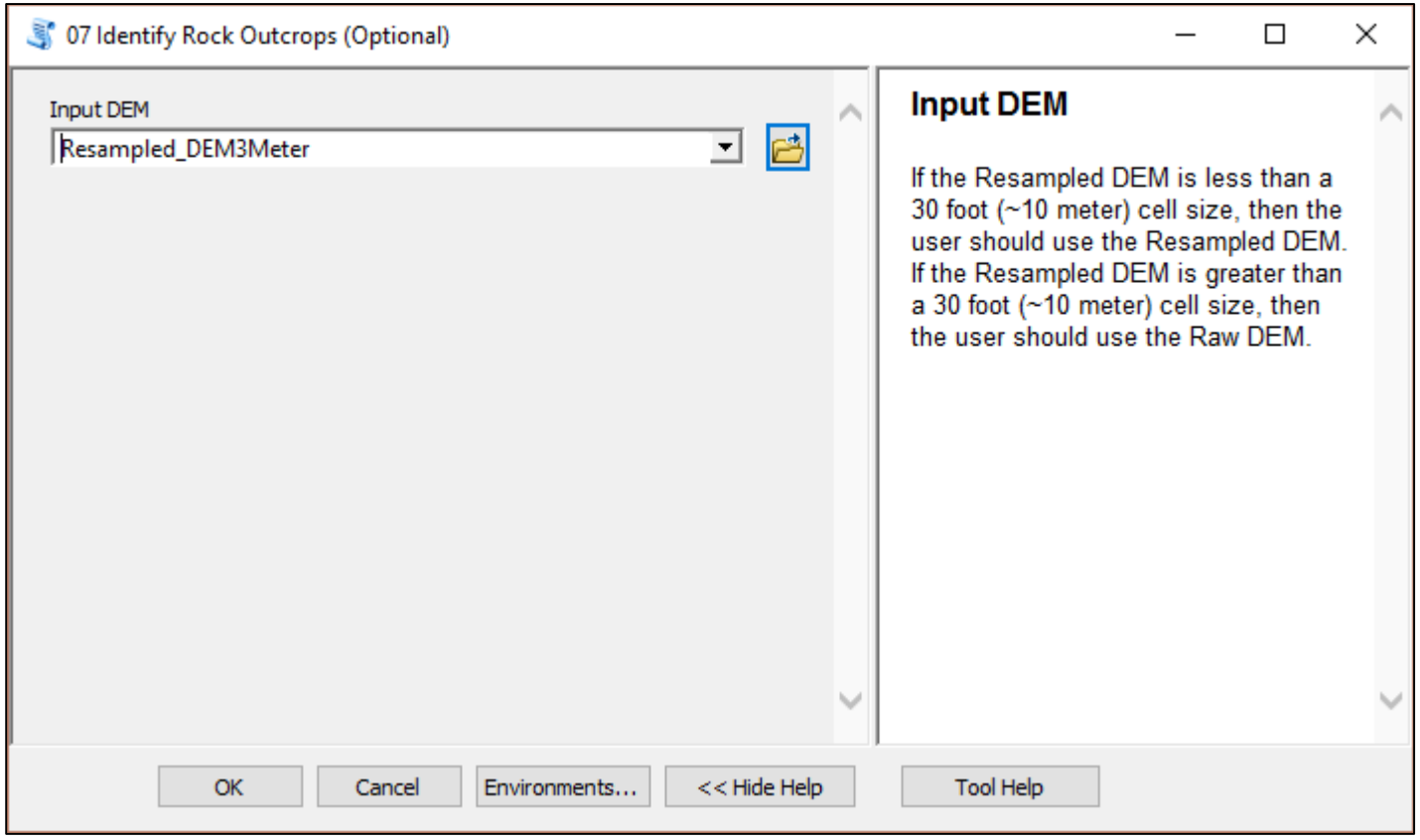


Approximately 12,000 pixels

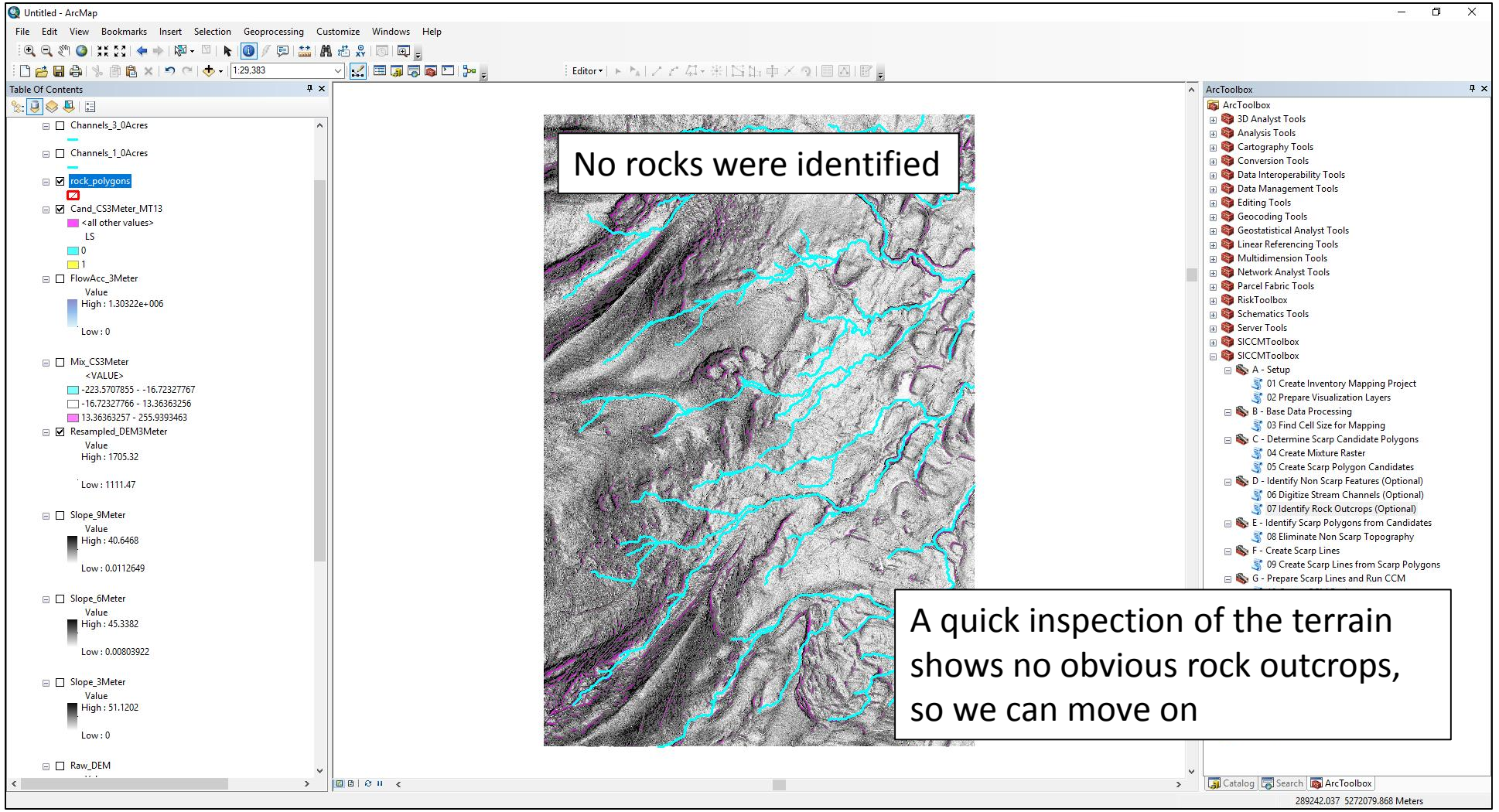
Rerun Tool 6


06 Digitize Stream Channels (Optional)
Input DEM
Resampled_DEM3Meter
Perform Default First Run (optional)
Custom Accumulation Area Units (optional)
Pixels
Custom Accumulation Area Values (optional)
12000
OK
Cancel
Environments...
<< Hide Help
Tool Help
06 Digitize Stream Channels (Optional)
Produces stream channel layers from
accumulated areas result in stream
channels that are long. All DEM pixels
that accumulate more than a given
accumulated area inpu
to be part of a stream
Uncheck this
Choose units of “Pixels” and enter the number found with the Identify cursor
You can enter as many as you would like. There will be one channel network for each value.
Result

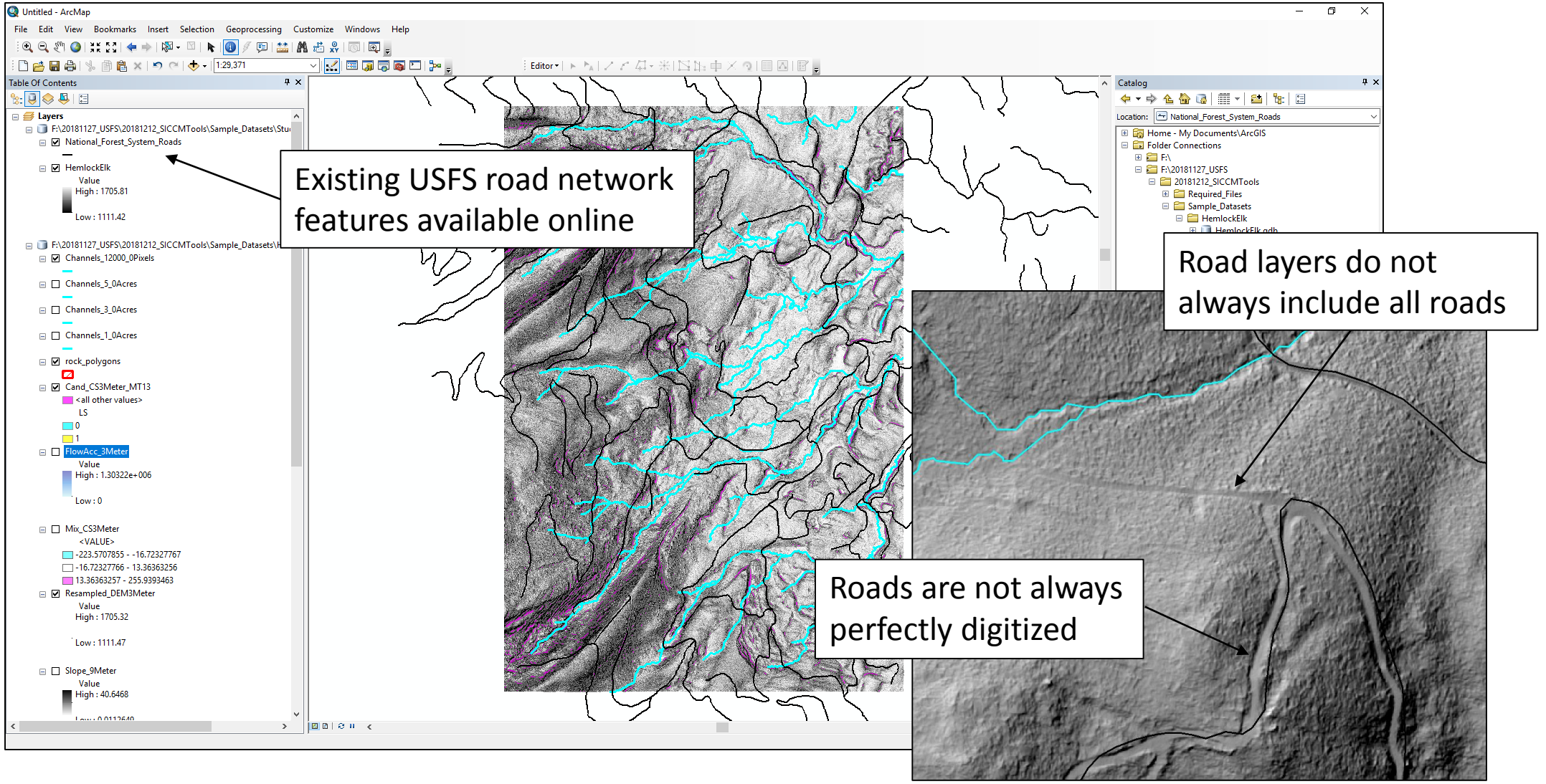
Run Tool 7


07 Identify Rock Outcrops (Optional)
Input DEM
Resampled_DEM3Meter
Input DEM
If the Resampled DEM is less than a 30 foot (~10 meter) cell size, then the user should use the Resampled DEM. If the Resampled DEM is greater than a 30 foot (~10 meter) cell size, then the user should use the Raw DEM.
OK
Cancel
Environments...
<< Hide Help
Tool Help

Output of Tool 7



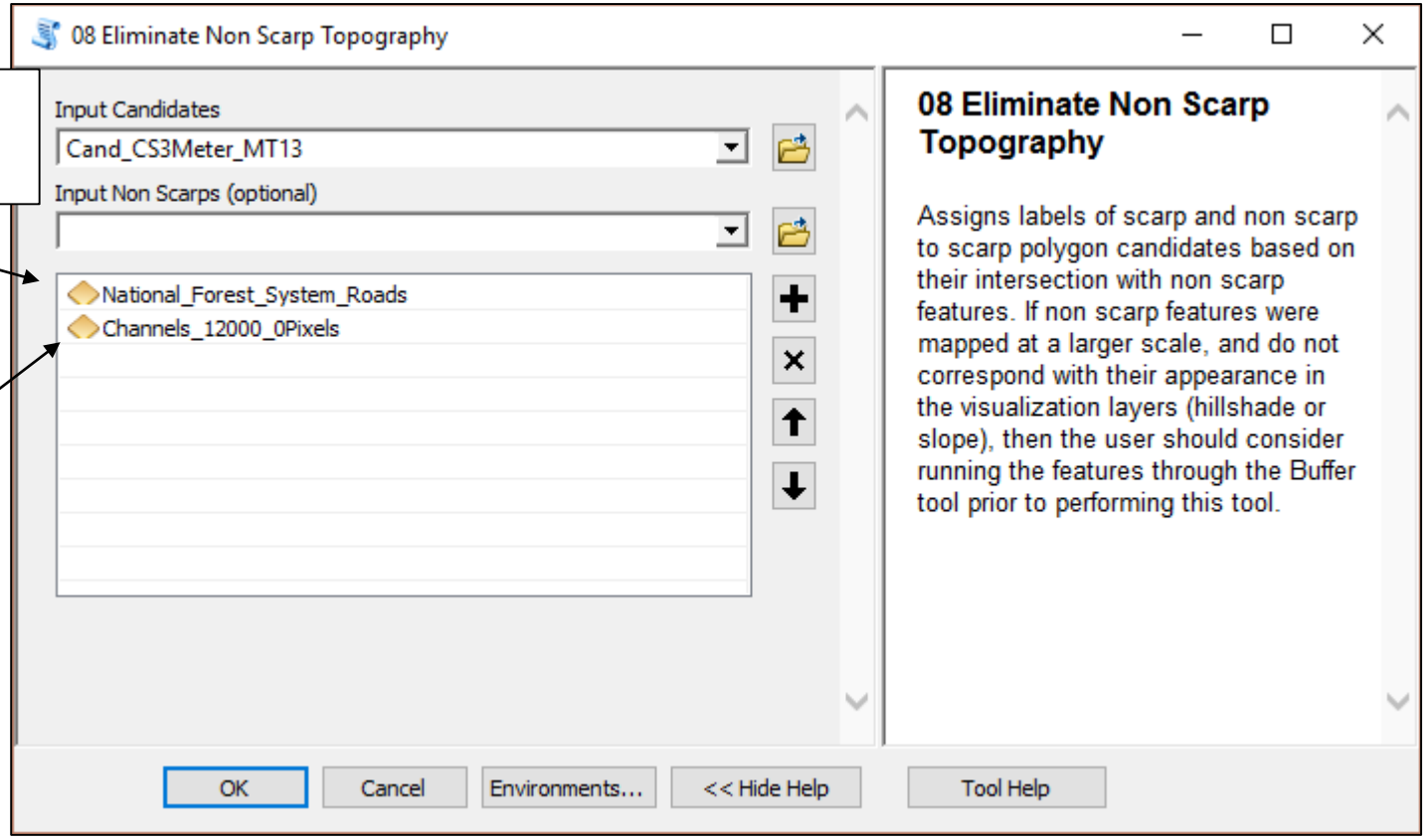
Add road layer to map



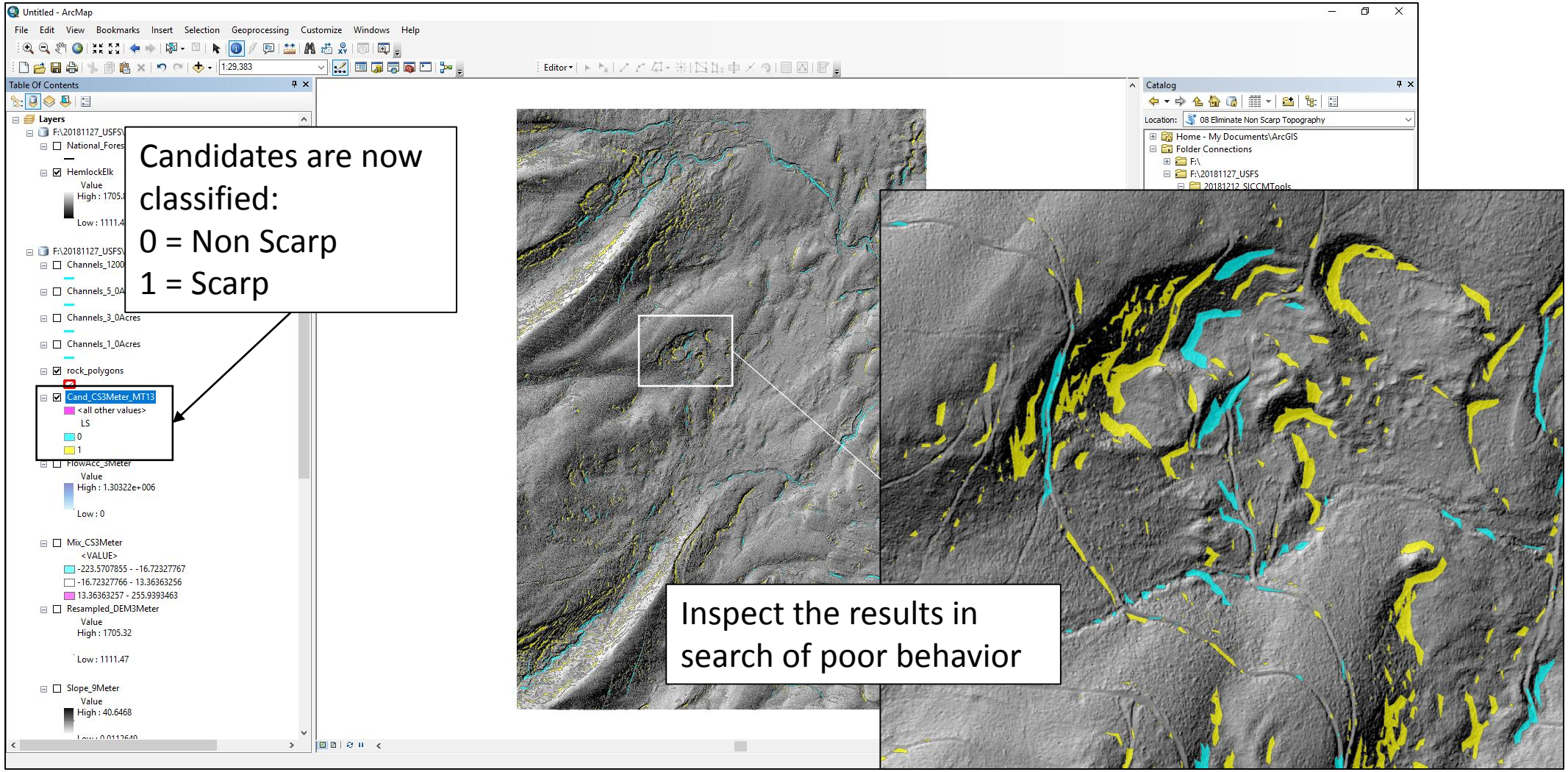
Run Tool 8

Only include roads if they are not poorly digitized

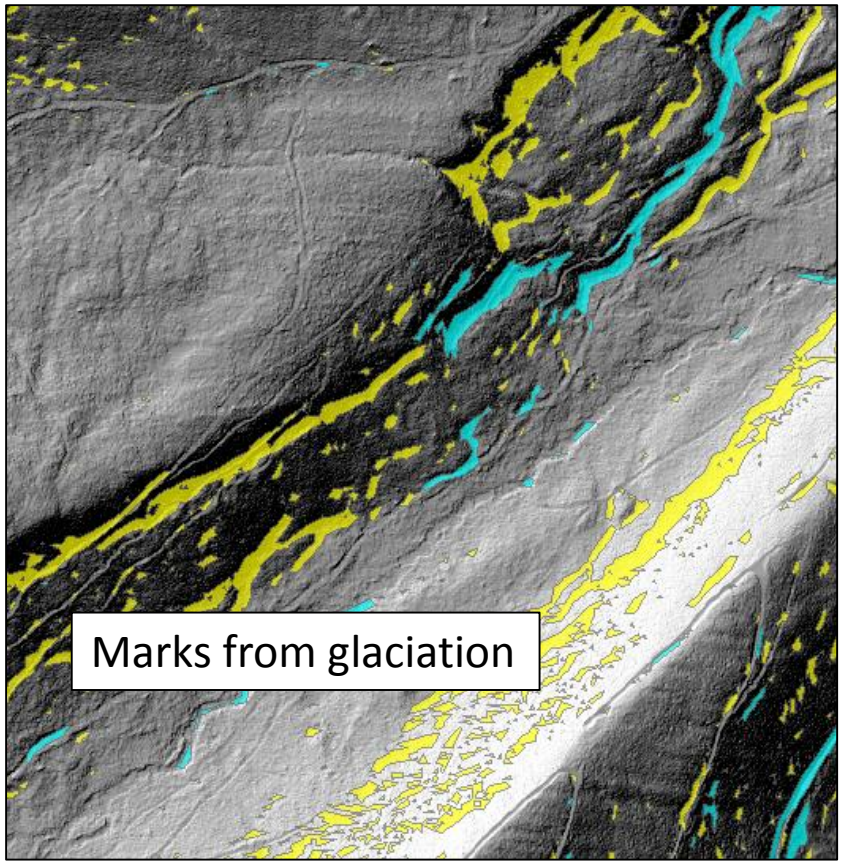
Best channel network

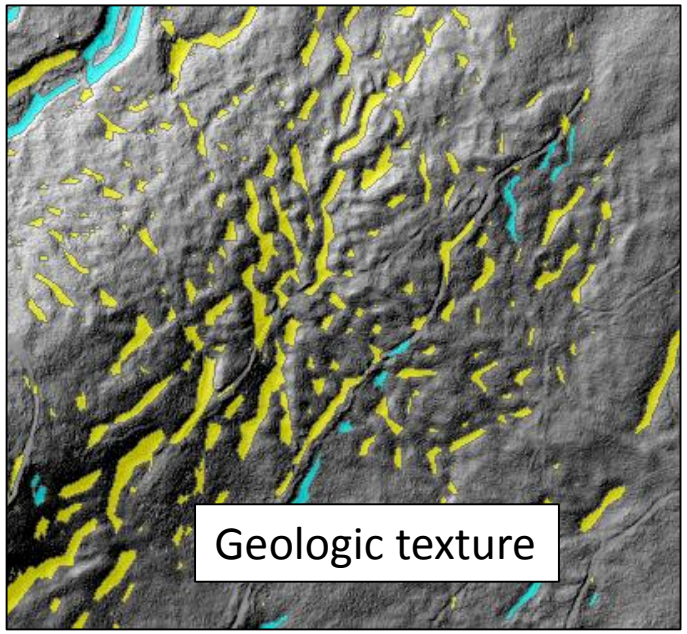


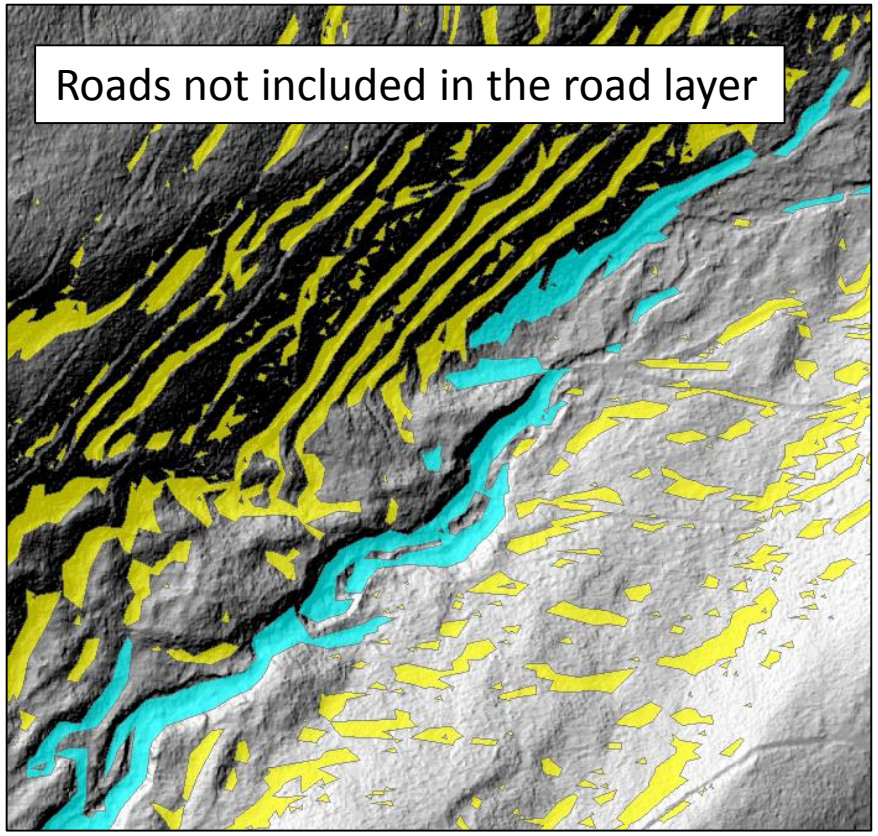
Tool 8 Output



There are too many scarp polygons!



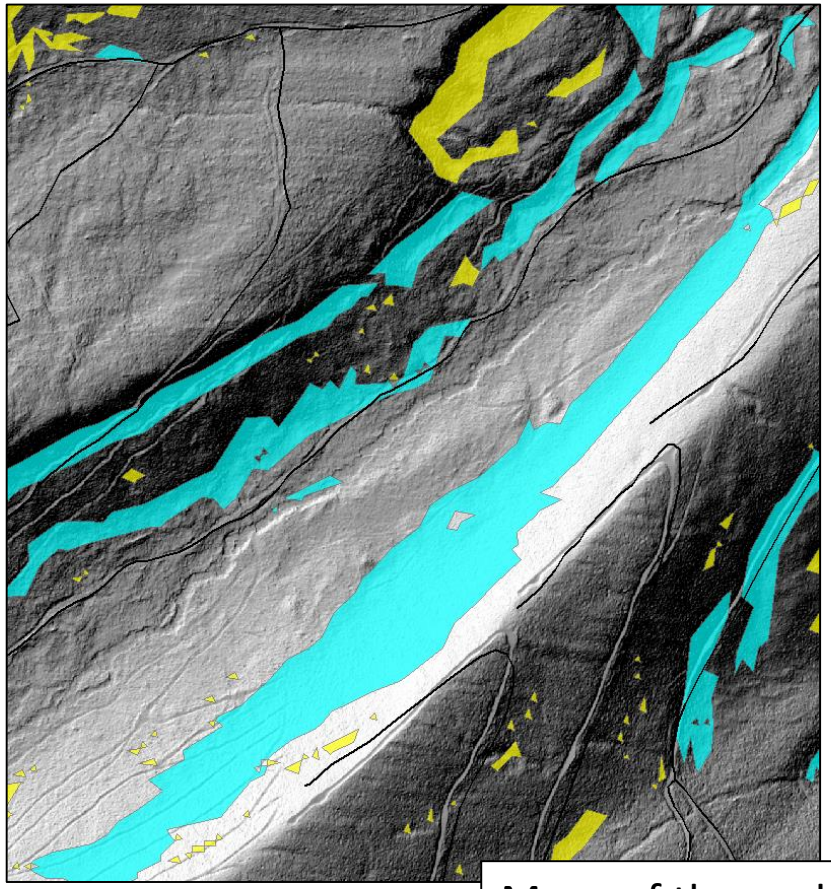


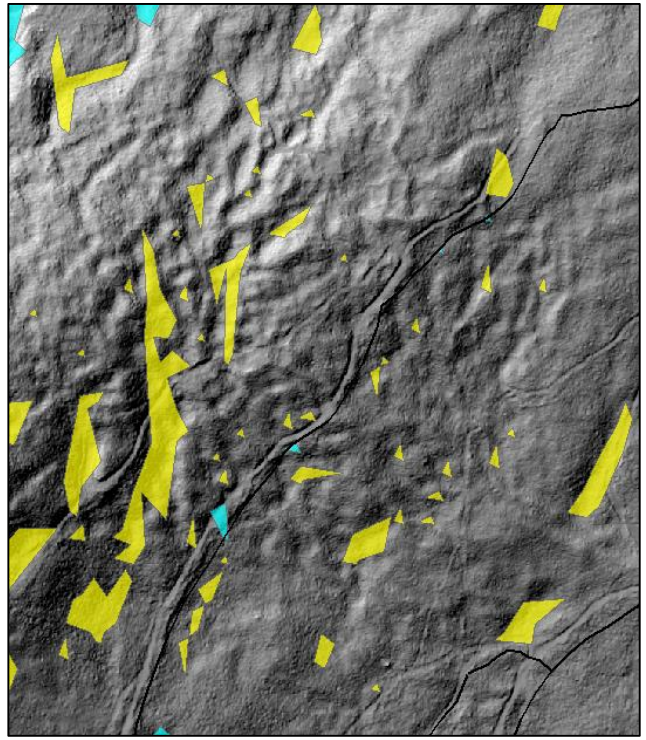


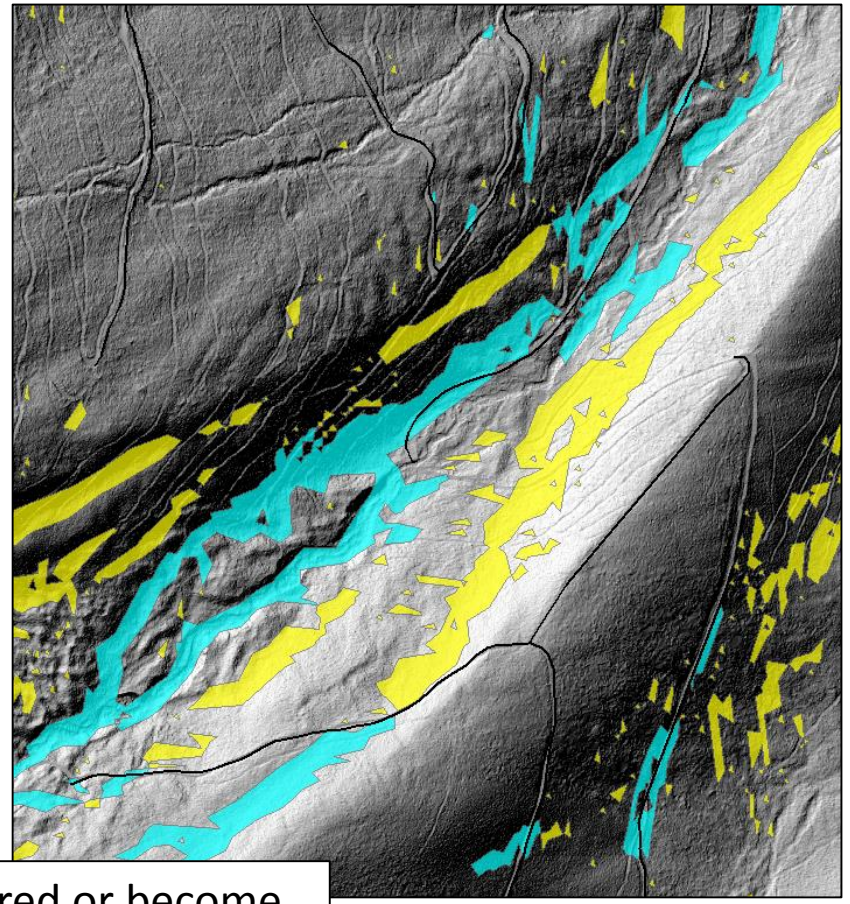
We have to step back to Tool 4 and repeat the process with a larger cell size

Tools 6 and 7 should not change much, so don't repeat them

Revised Tool 8 Output

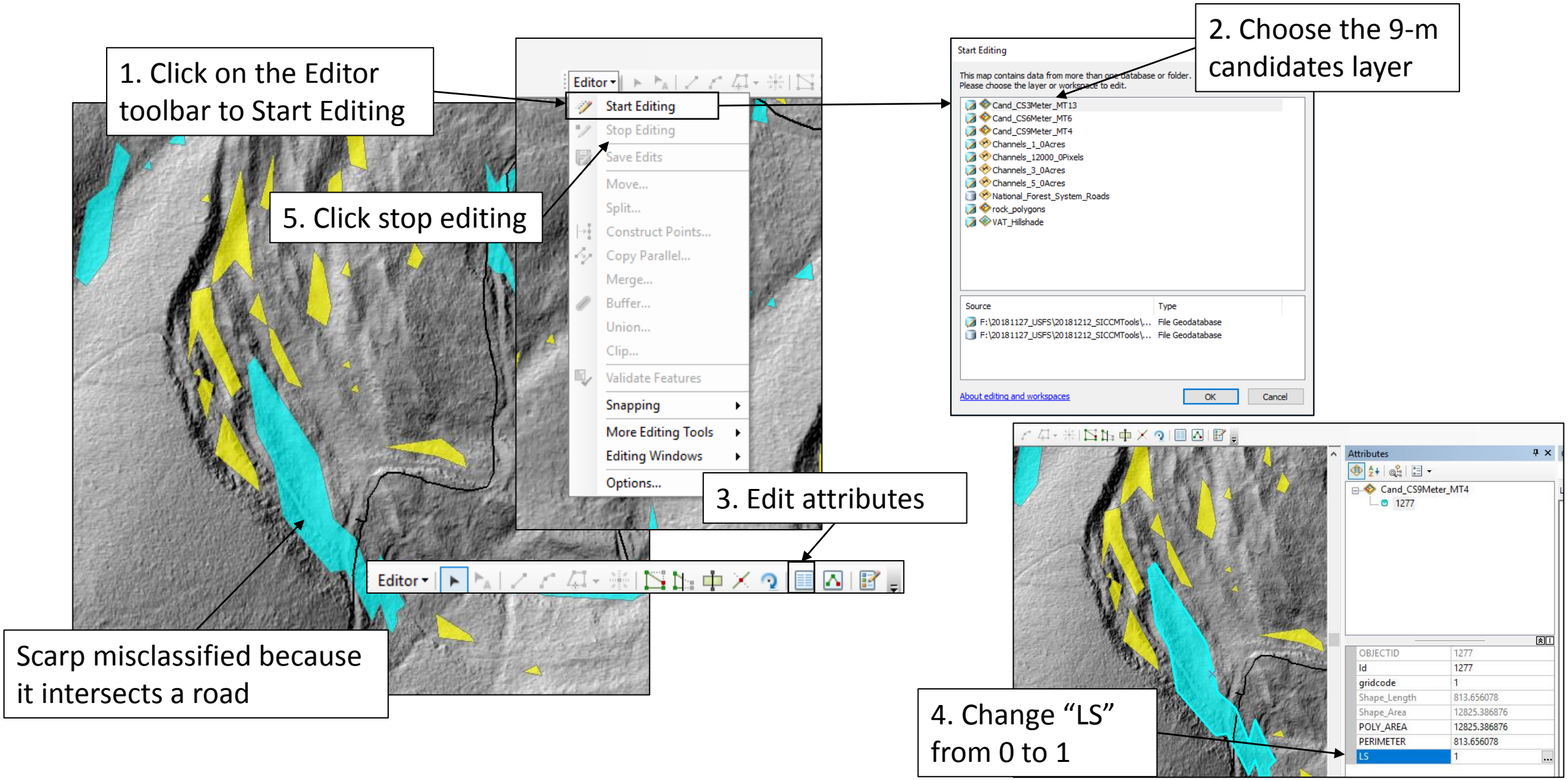




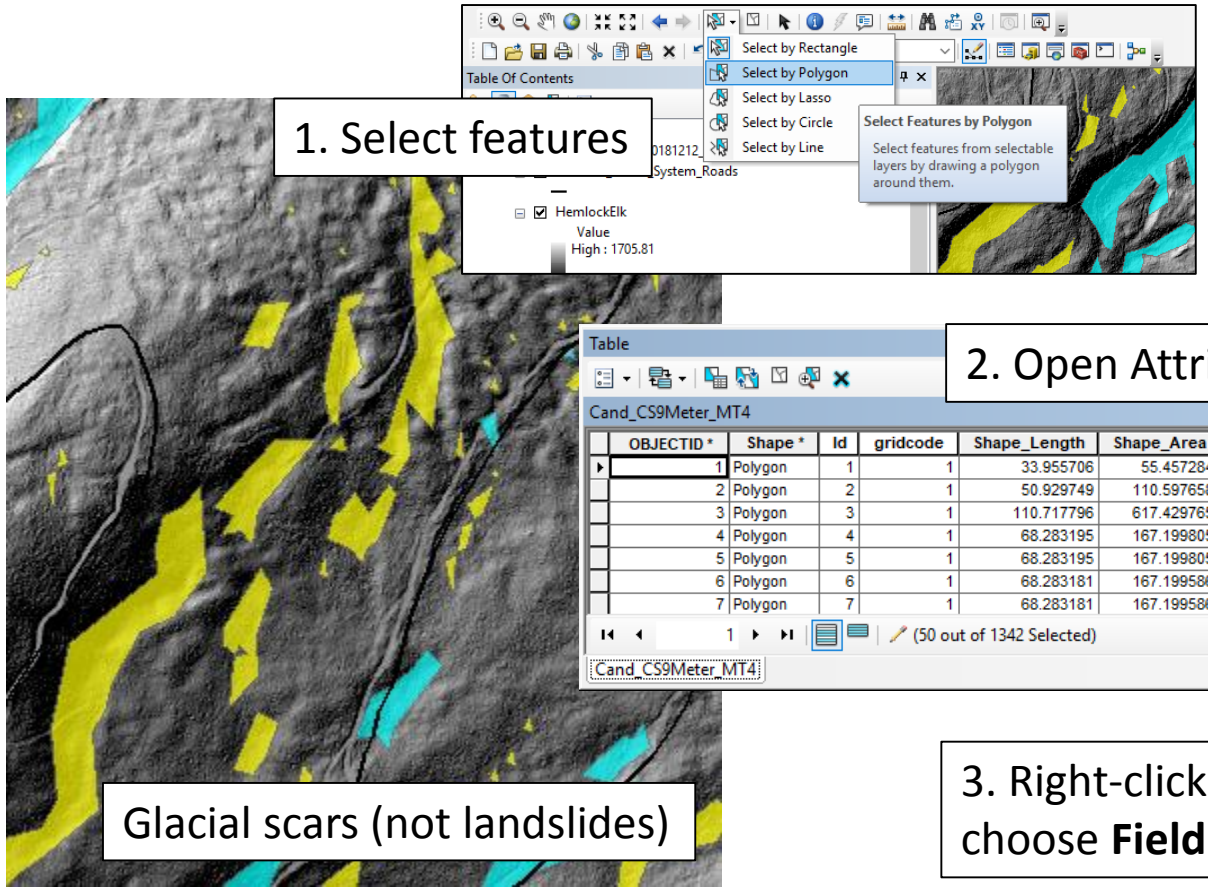


Many of the problem features have either disappeared or become non scarps by using a cell size of 9-meters instead of 3-meters

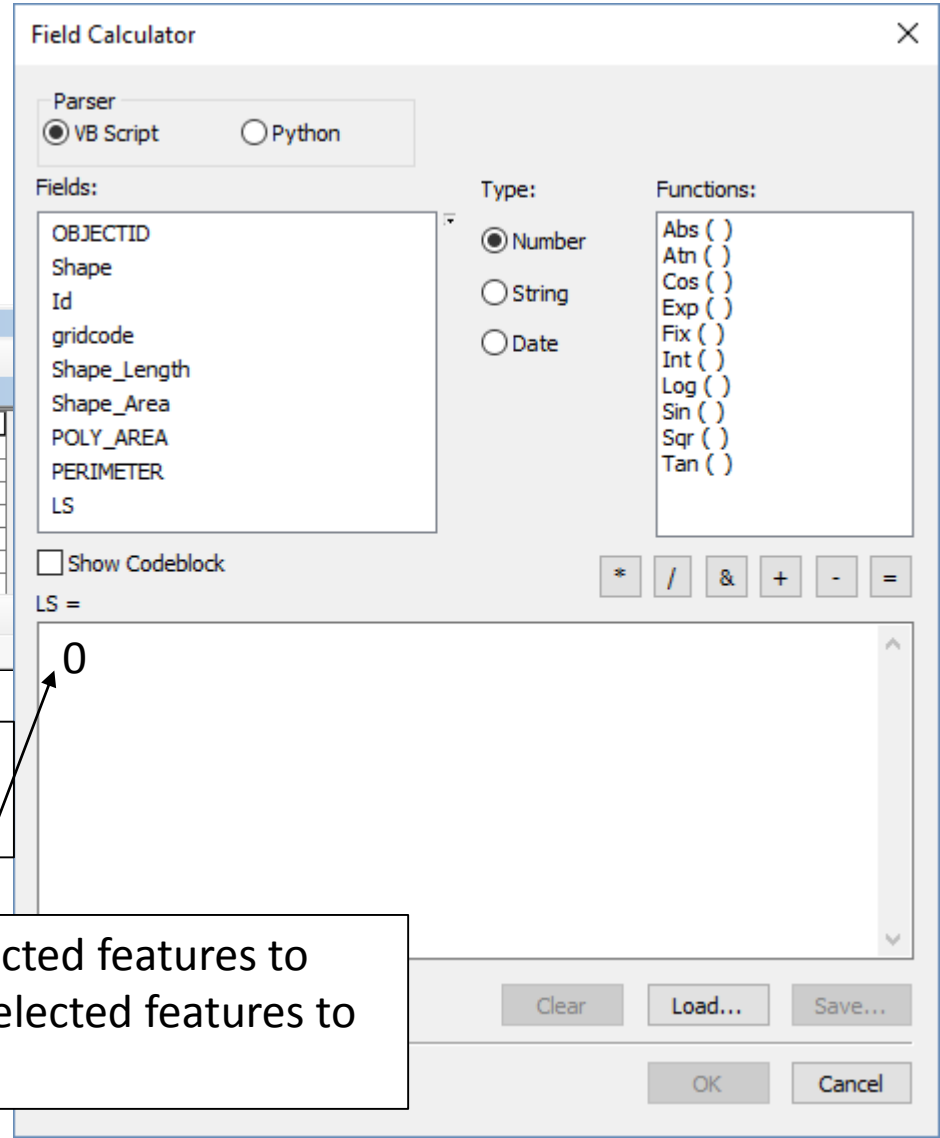
Manually editing polygons



Editing groups of polygons



3. Right-click “LS” and choose **Field Calculator**

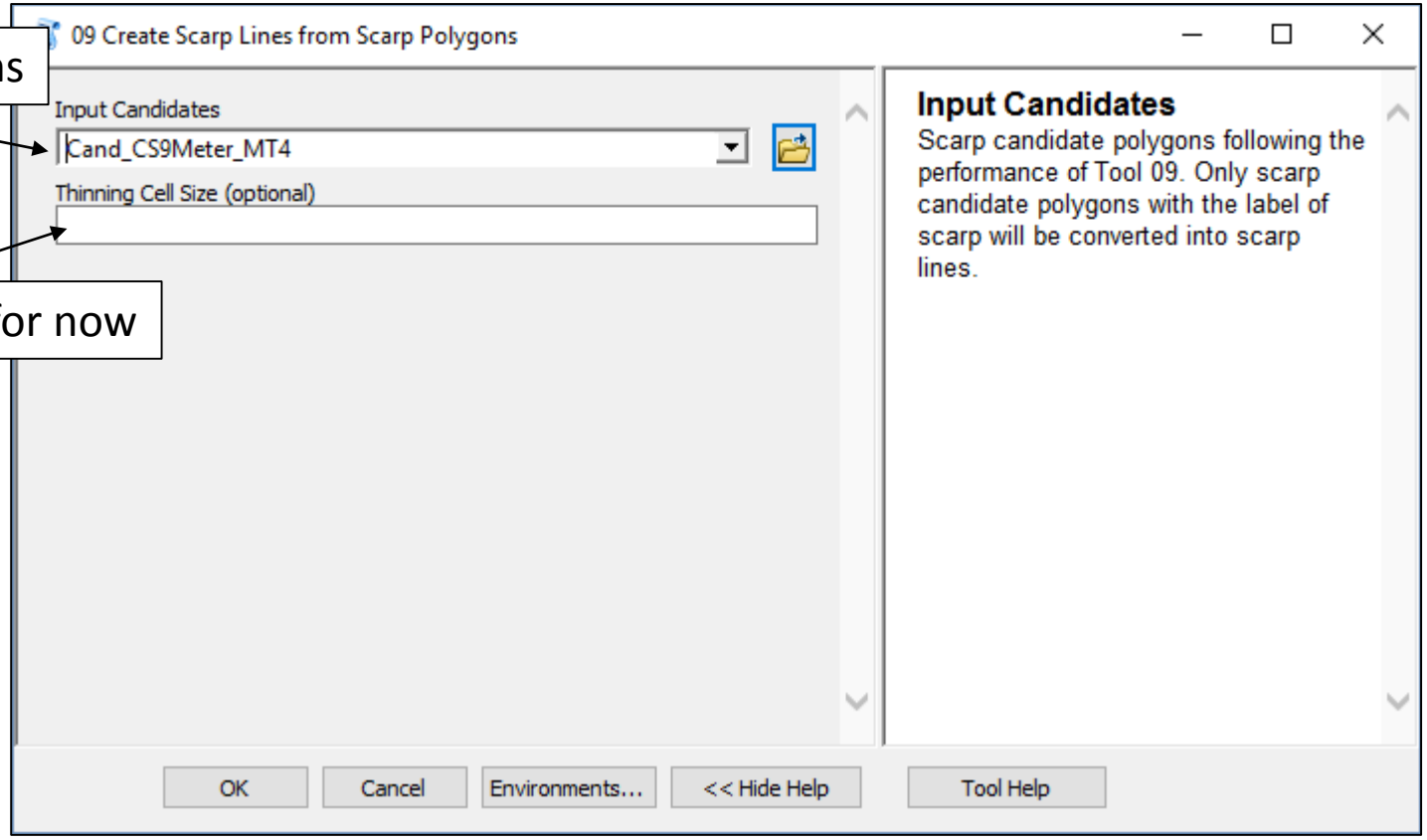


4. Type 1 to change selected features to scarps, or 0 to change selected features to non scarps

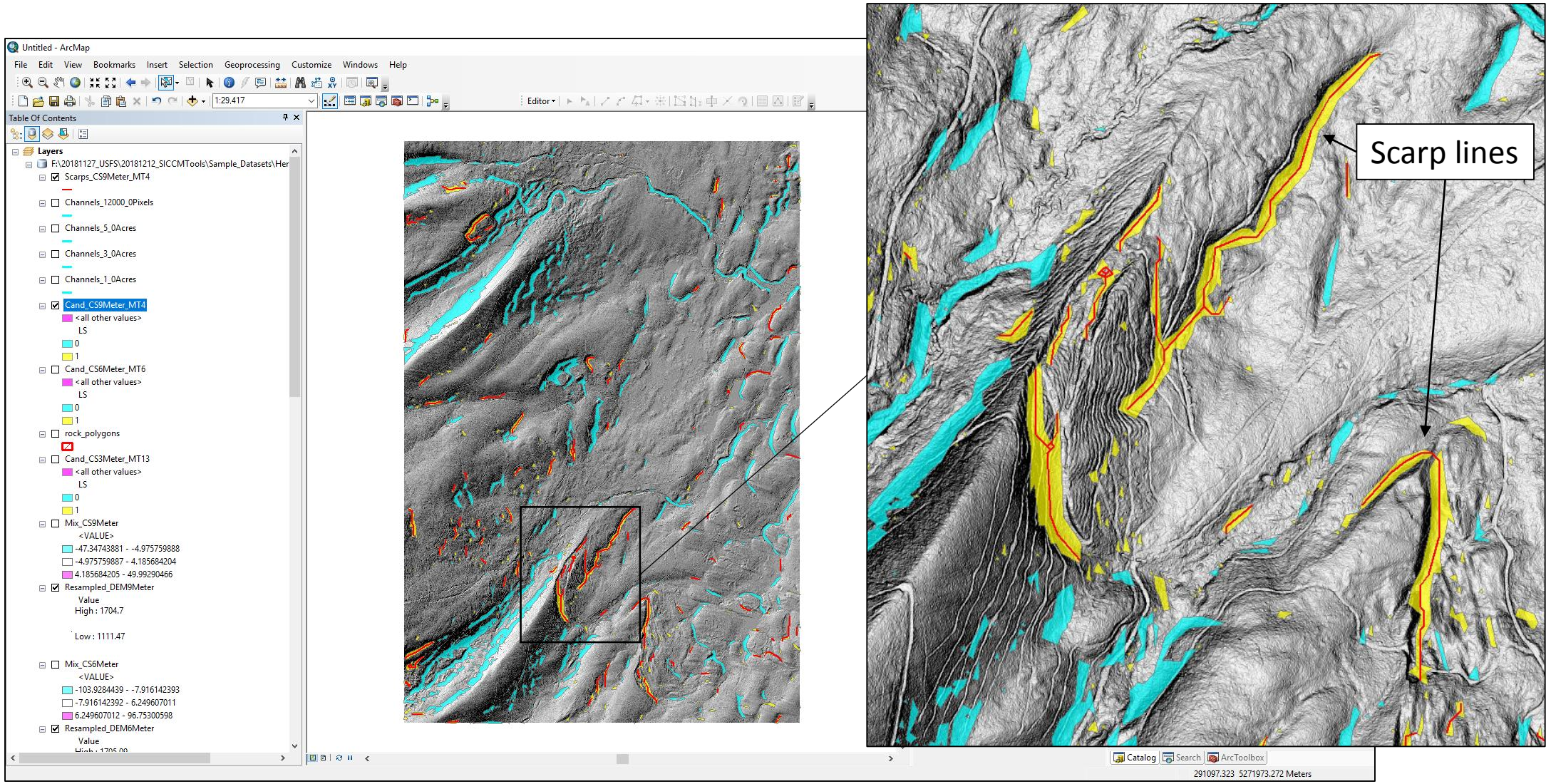
Run Tool 9

The 9-meter polygons

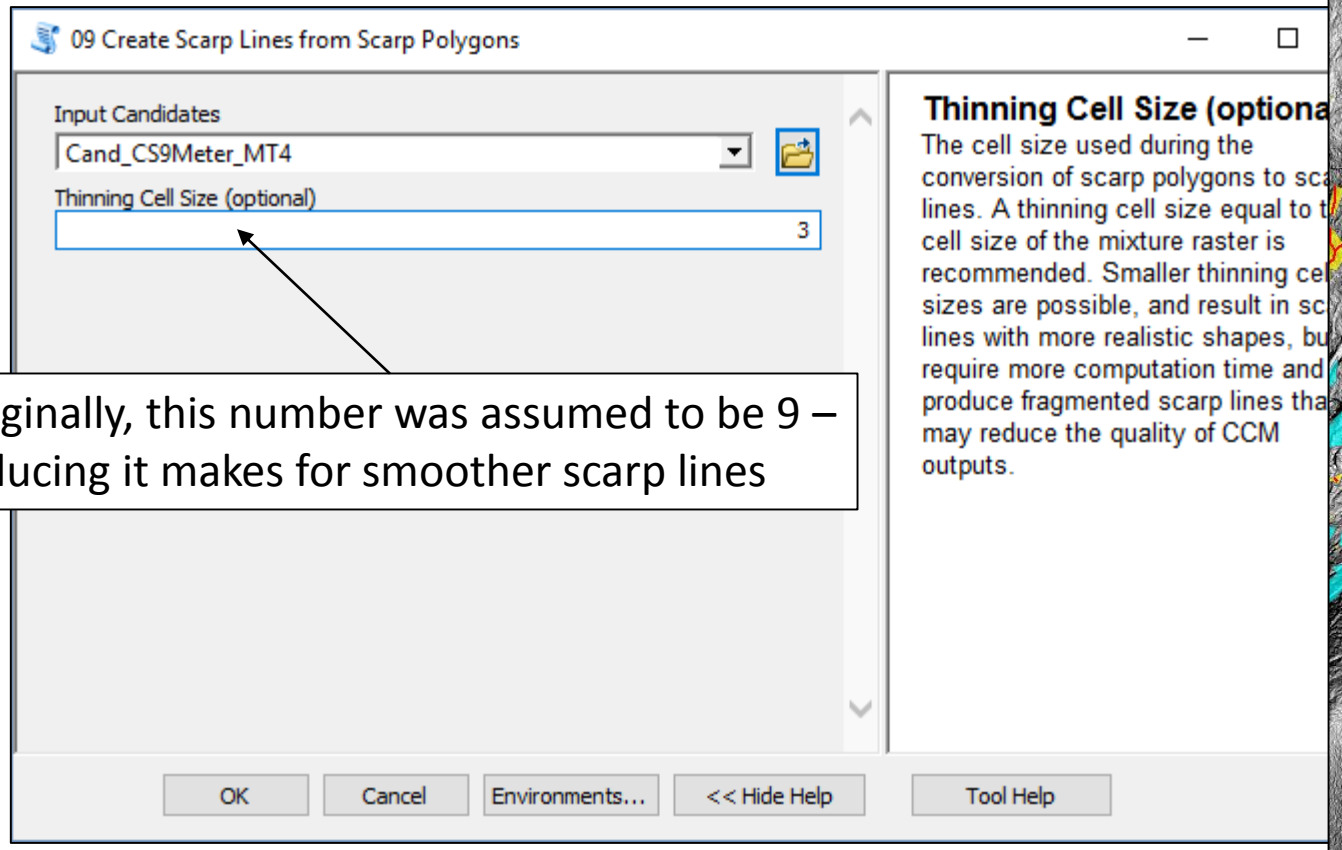
Leave this blank for now



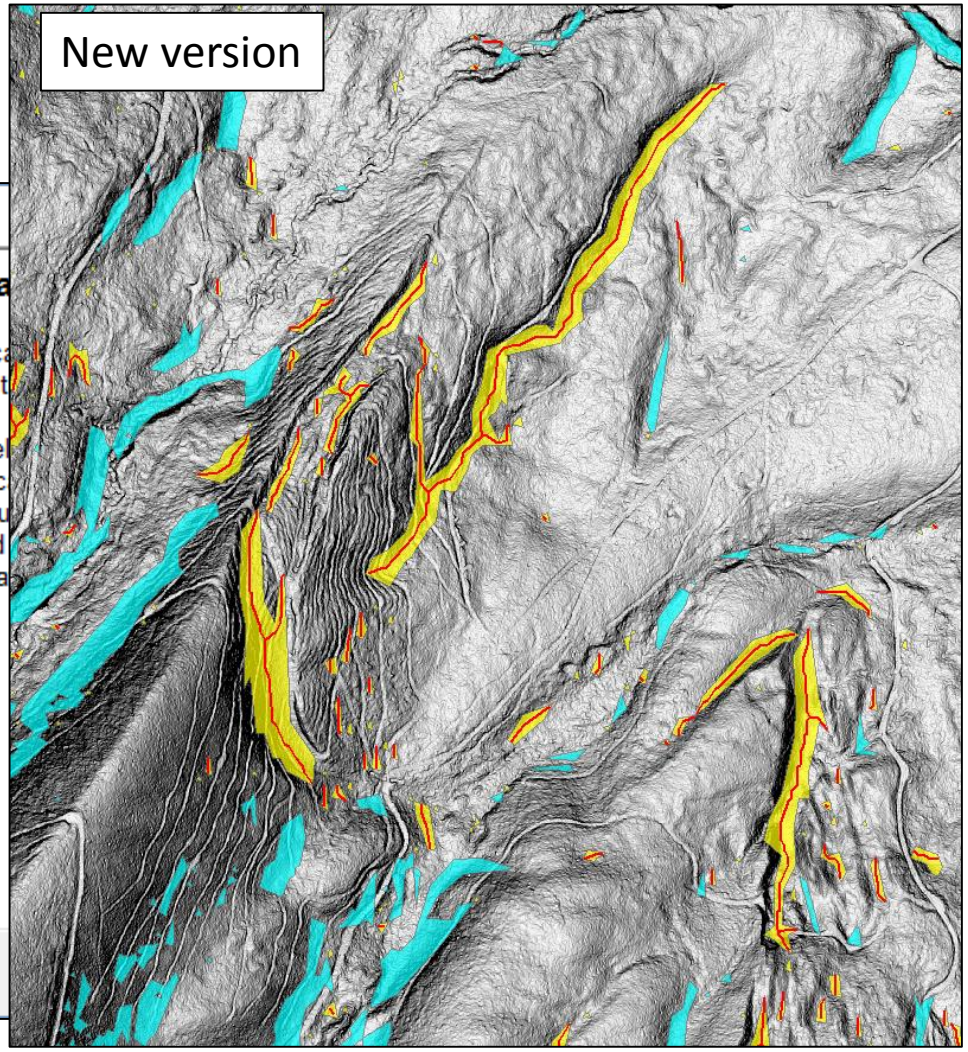
Tool 9 Output



Rerun Tool 9

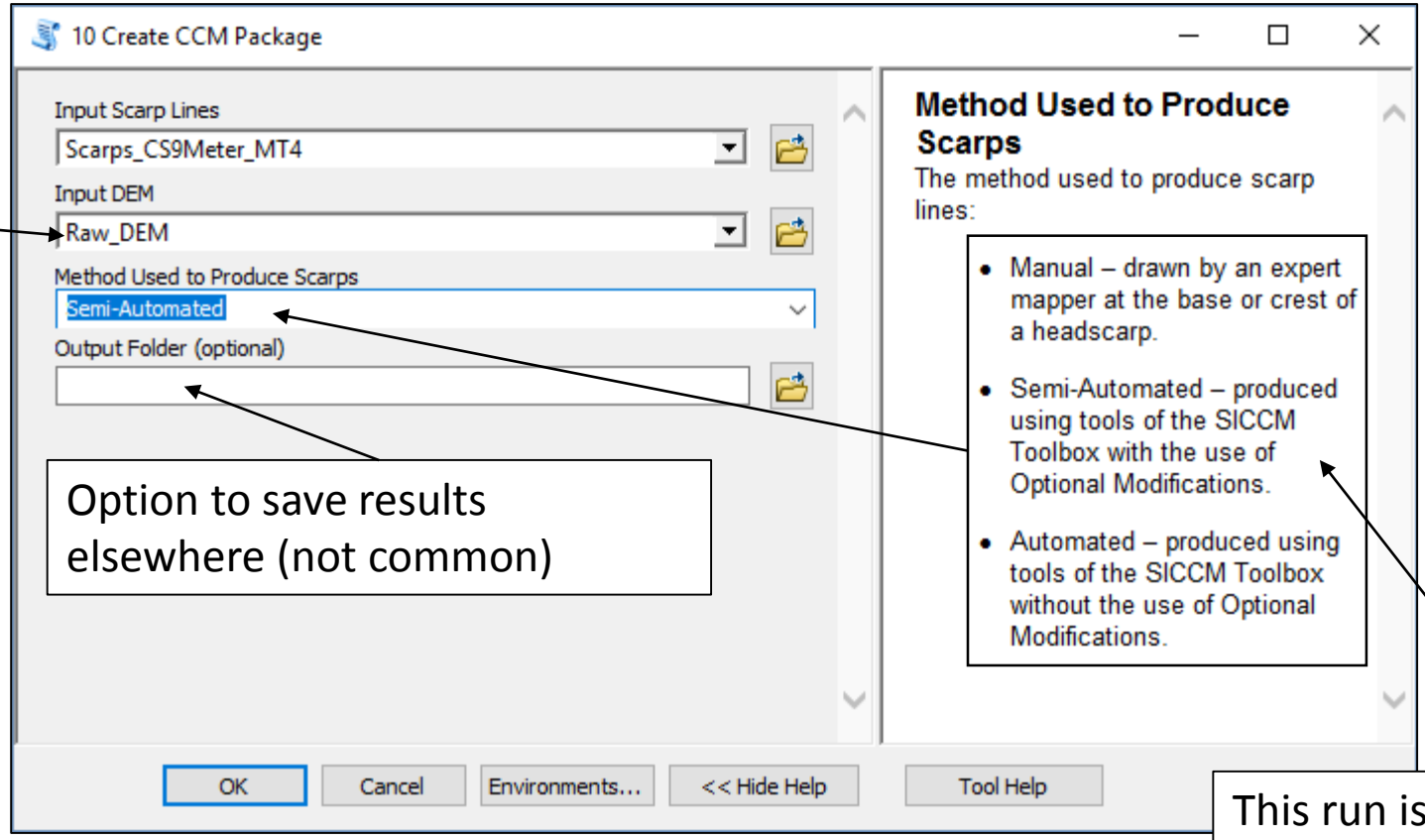


Originally, this number was assumed to be 9 – reducing it makes for smoother scarp lines



The user should choose the thinning cell size only if they feel that the scarp lines are too roughly drawn

Run Tool 10

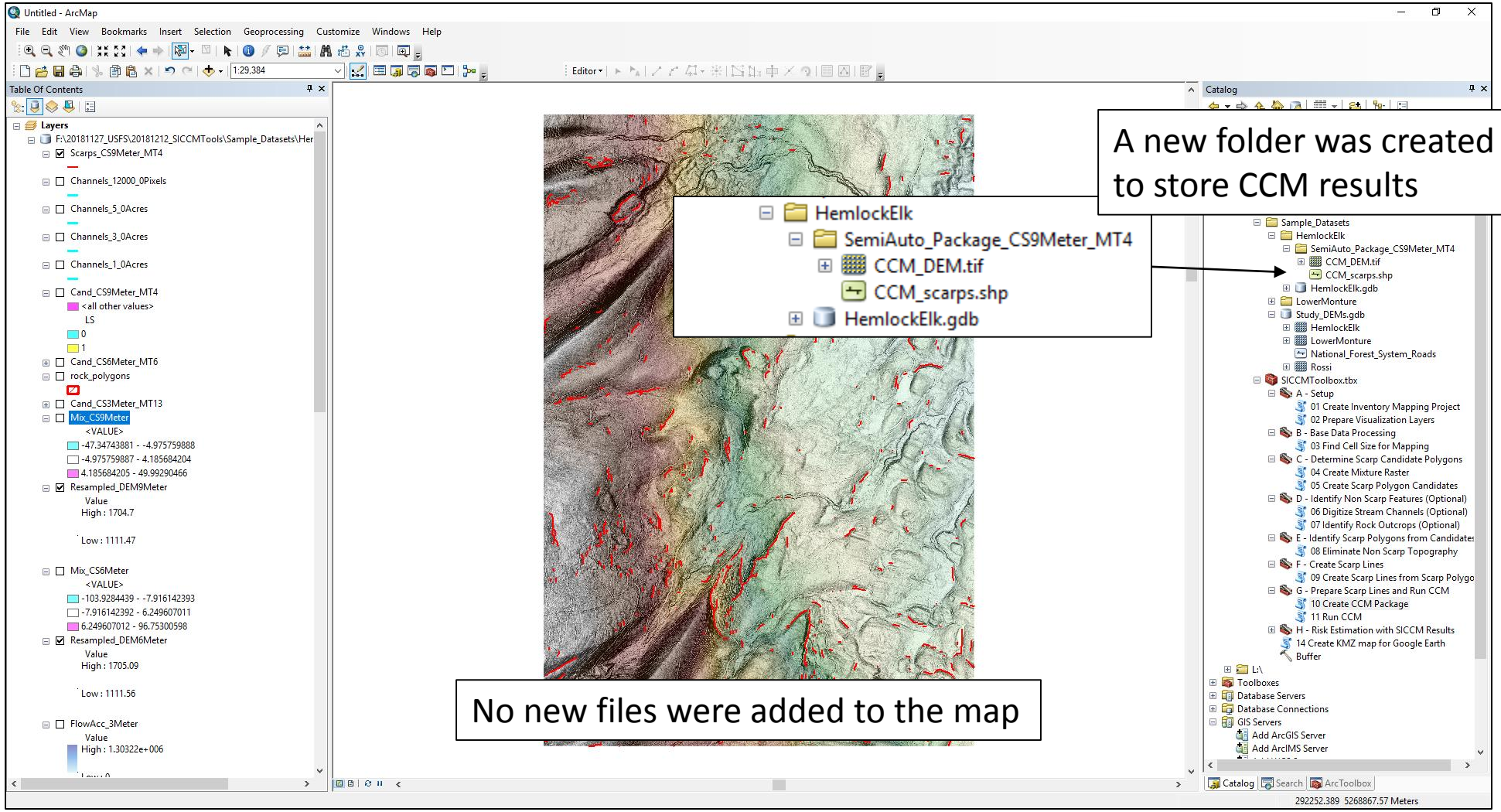


Raw DEM (1-meter)

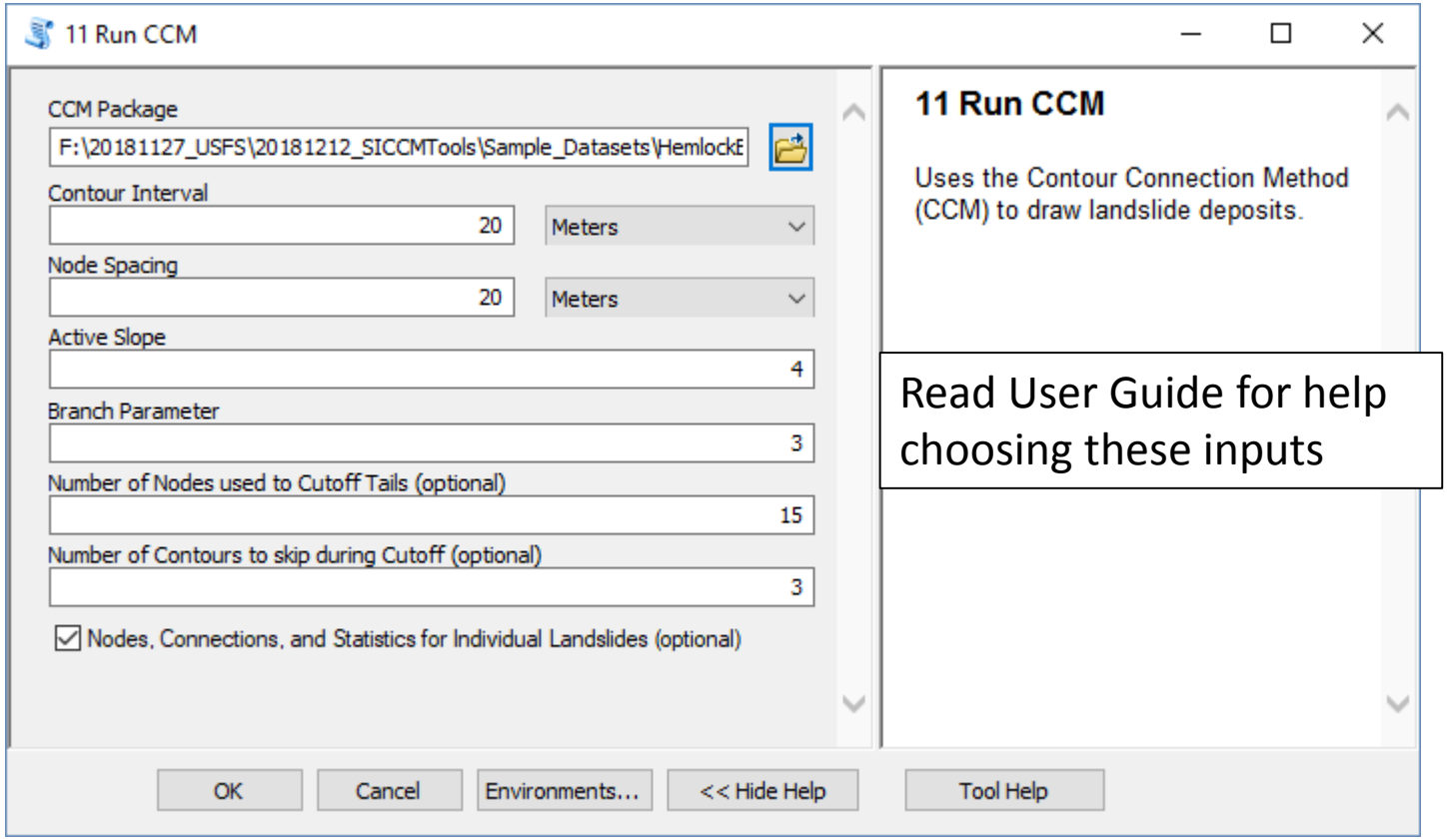
Option to save results elsewhere (not common)

This run is semi-automated because of how we manually changed polygon classifications and stream channel lengths

Tool 10 Output

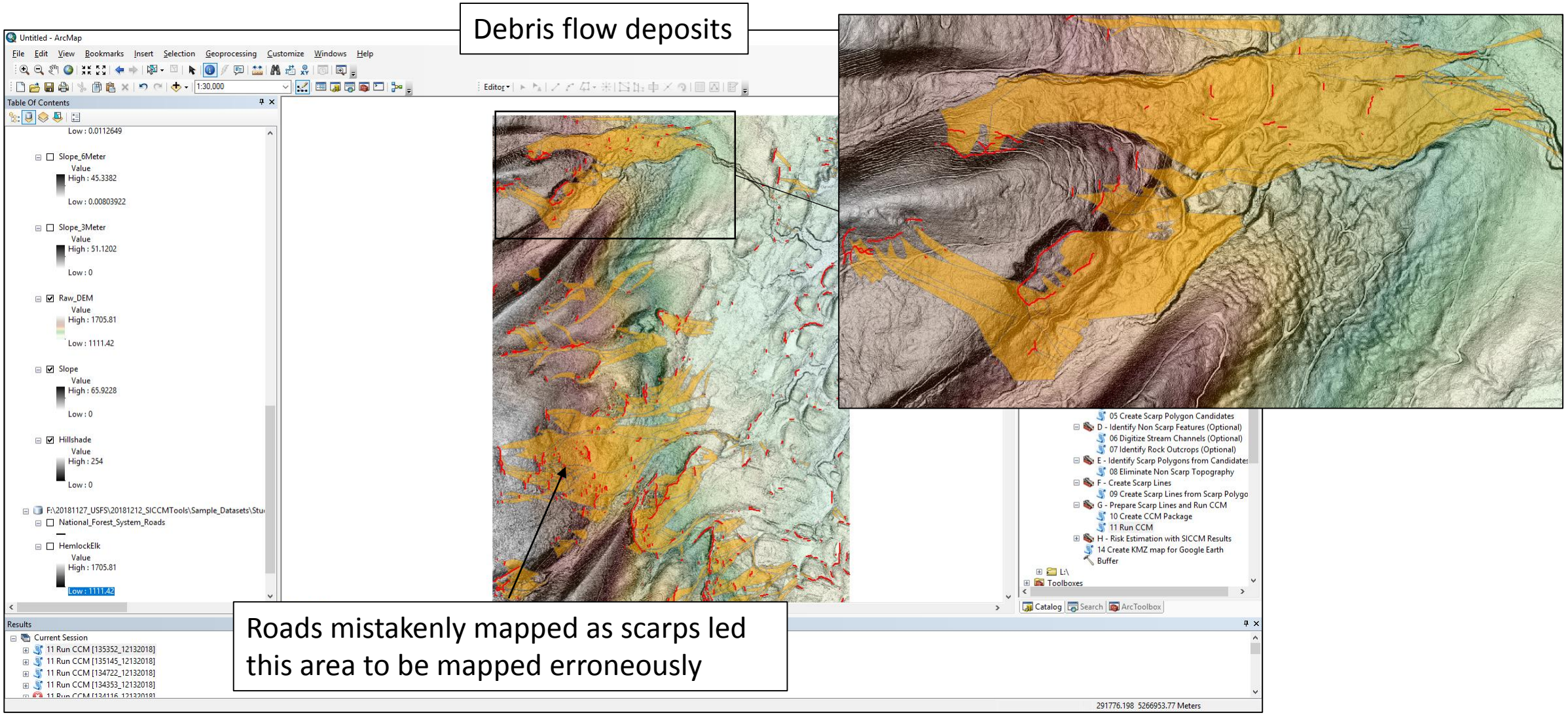


Run Tool 11



Read User Guide for help choosing these inputs

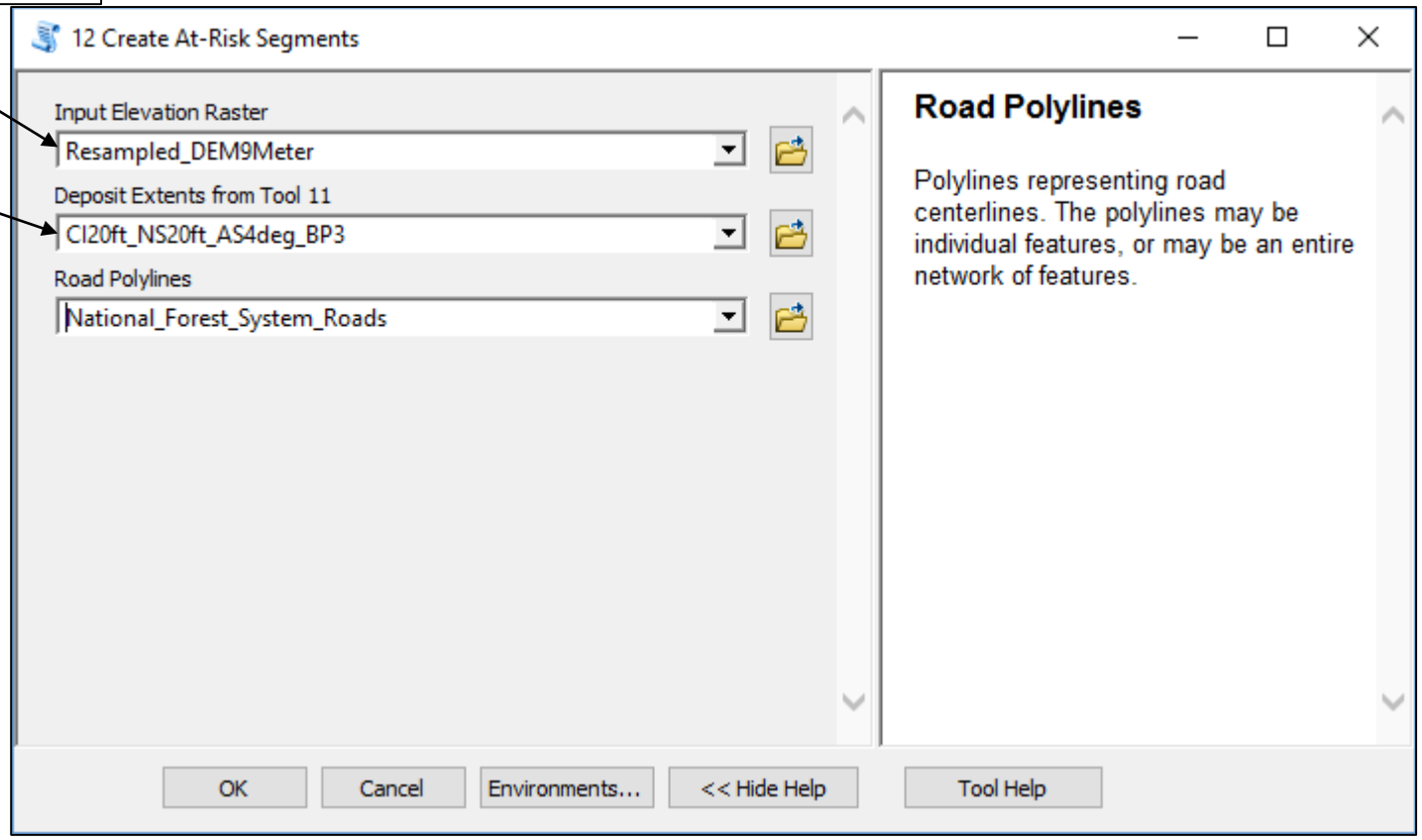
Tool 11 Output



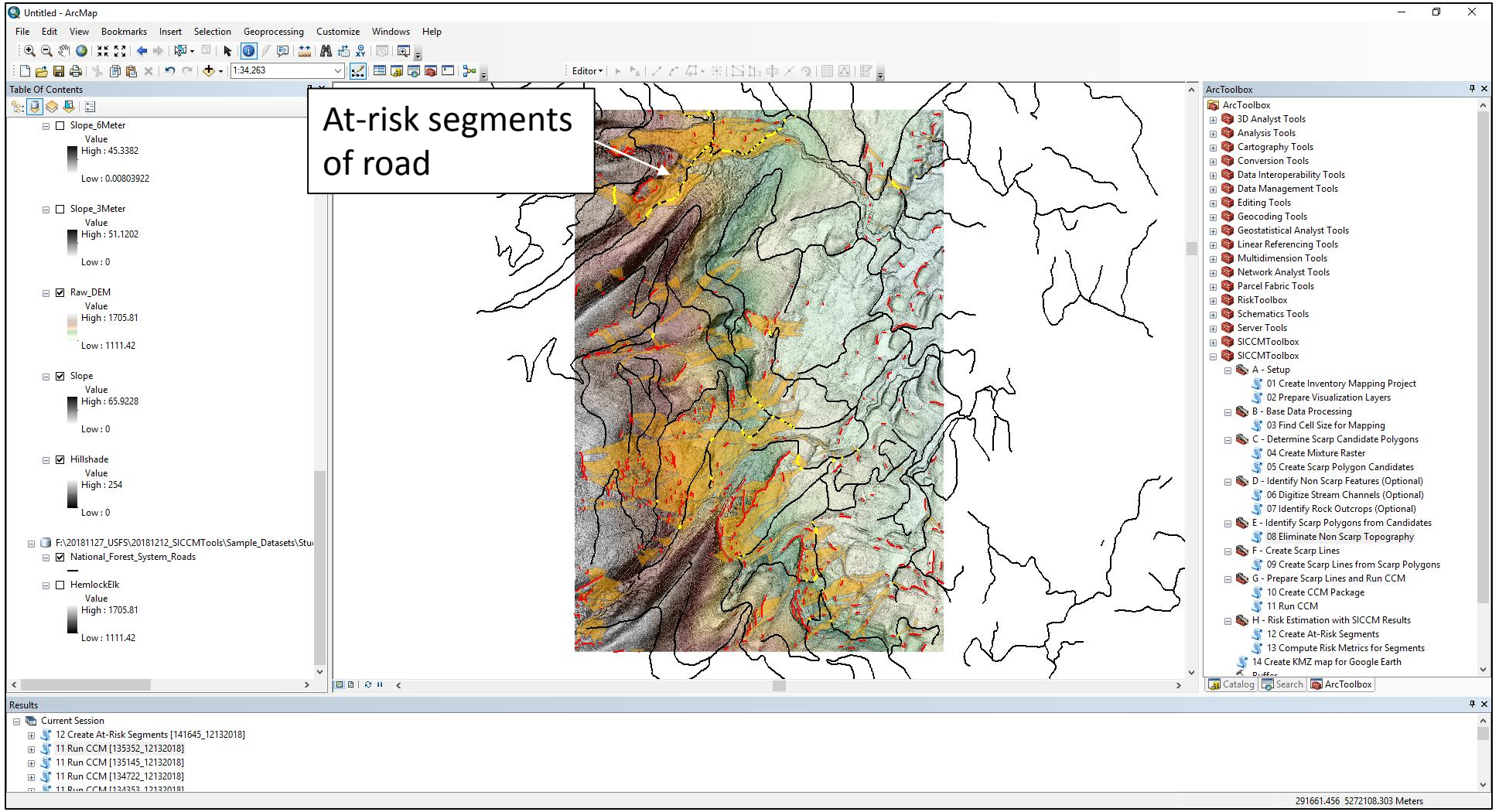
Run Tool 12

The resampled DEM runs more quickly, but does not consider smaller features

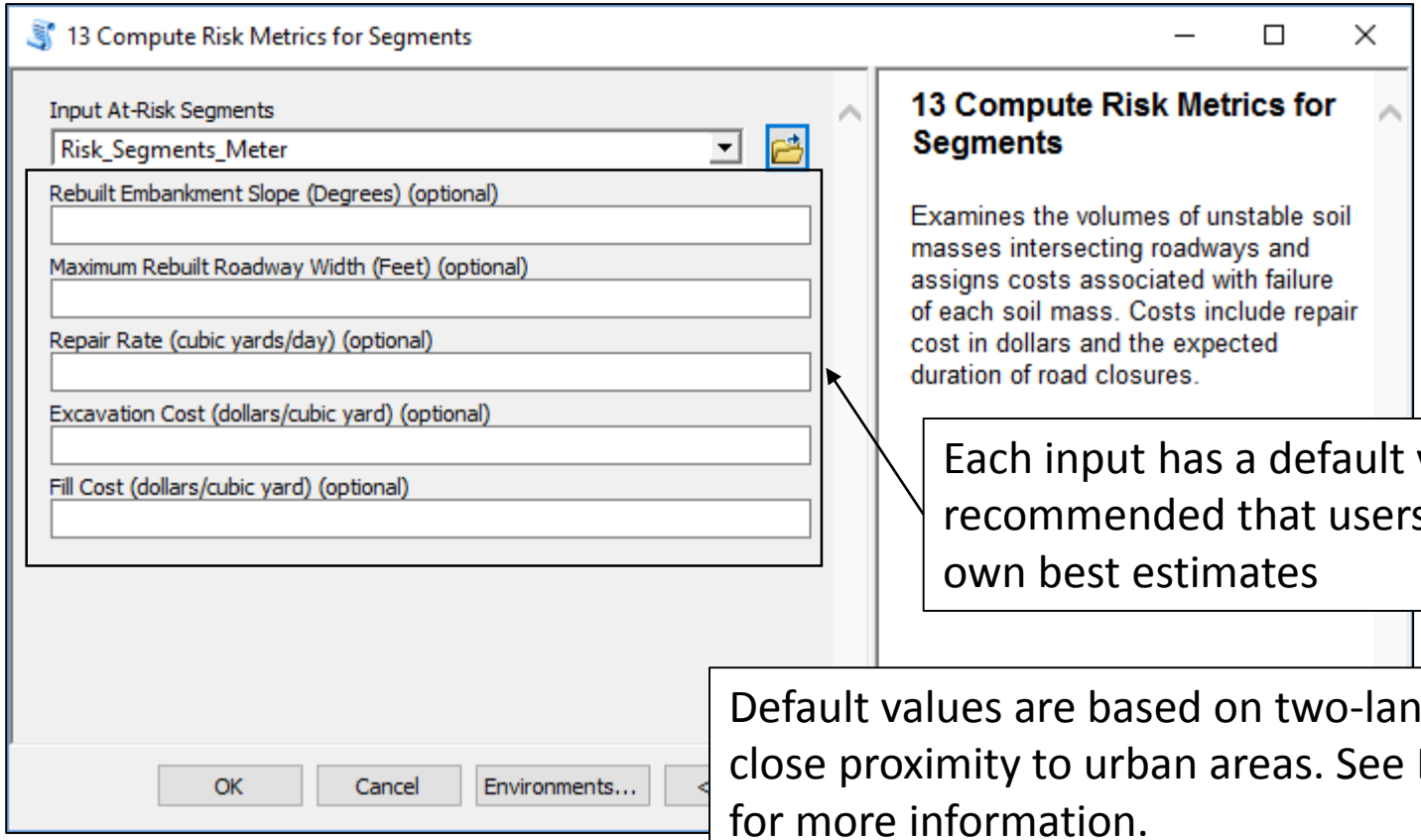
CCM output polygons



Tool 12 Output



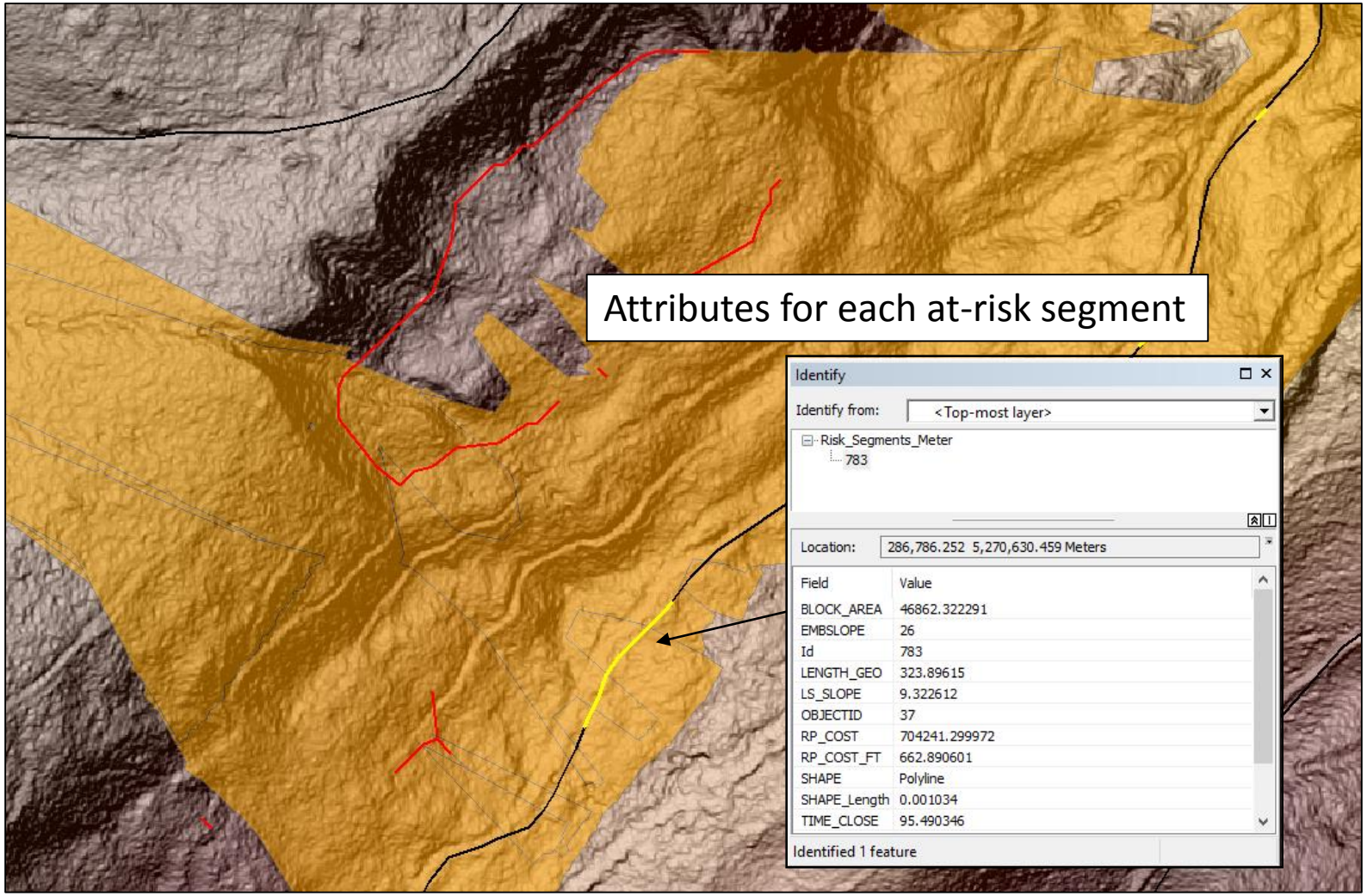
Run Tool 13



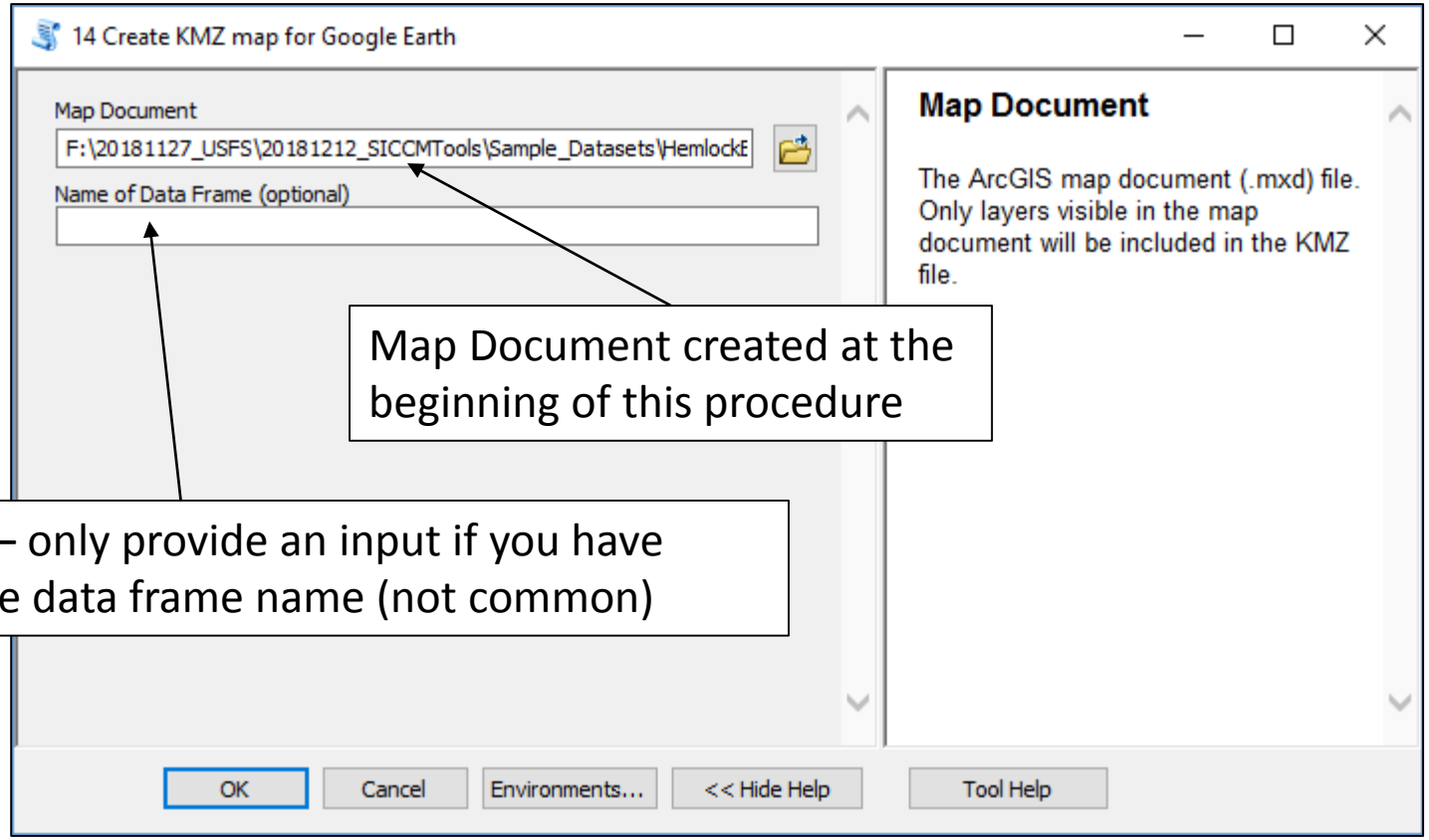
Each input has a default value, but it is recommended that users input their own best estimates

Default values are based on two-lane paved highways in close proximity to urban areas. See Leshchinsky et al. (2018) for more information.

Tool 13 Output



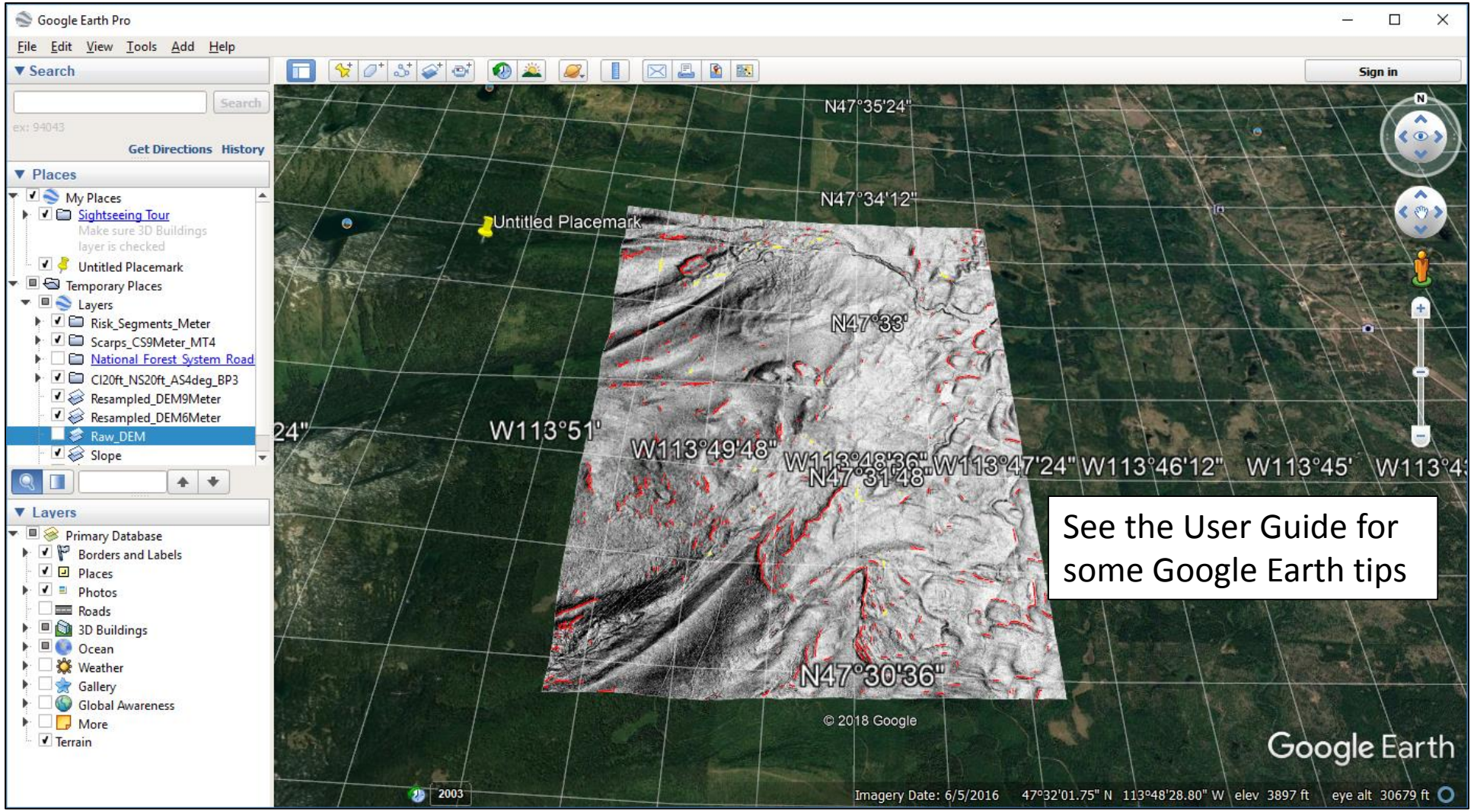
Run Tool 14



Map Document created at the beginning of this procedure

Name of data frame – only provide an input if you have manually changed the data frame name (not common)

Tool 14 Output



You have completed the tutorial

If you have any questions with the steps described during this tutorial, please refer to the ***Guide to Operation of the Scarp Identification+Contour Connection Method (SICCM) ArcGIS Toolbox*** **for more information**

Acknowledgements

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Reference:

Leshchinsky, B., Olsen, M.J., and Bunn, M.D. (2018). "Enhancing Landslide Inventorying, Lidar Hazard Assessment and Asset Management". Final Technical Report, Oregon Department of Transportation, SPR786.