

Channel Extraction Toolbar for ArcGIS 10.6 and 10.7

User's Manual

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1. Introduction

The Channel Extraction add-in toolbar for ArcGIS 10.6 and 10.7 is developed using the Python programming language with ArcPy, NumPy, and SciPy. This is a semi-automated tool for users to (1) extract channels from high-resolution digital elevation models (DEM) such as LiDAR-derived DEMs, (2) extract longitudinal profiles of the channels, and (3) calculate quantitative measures including positional accuracies of the channel and slopes of the longitudinal profile segments (saved in the output spreadsheet “long.xls”). The installation steps, graphical user interface, and application demonstrations are explained in the following sections. The tool has been tested in ArcGIS 10.6 and 10.7, but not in other ArcGIS versions.

2. Installation

The add-in (ChannelExtraction.esriaddin), test data (safdem.tif, safhills.tif), and this manual (Channel Extraction Manual.pdf) can be downloaded from <http://geography.unt.edu/~pdong/software/channel> (right click a file and select “Save link as...”). The file “safdem.tif” is a DEM for Wallace Creek across the San Andreas Fault near Carrizo Plain in California, USA, and “safhills.tif” is a hillshaded DEM for the same area. To install the add-in, you can simply double click the downloaded file “ChannelExtraction.esriaddin”, then open ArcMap, go to the menu “Customize” and select “Add-in Manager” (Figure 1). In the “Add-in Manager” window, select “Channel Extraction”, then click “Customize” to open the Customize window (Figure 2).

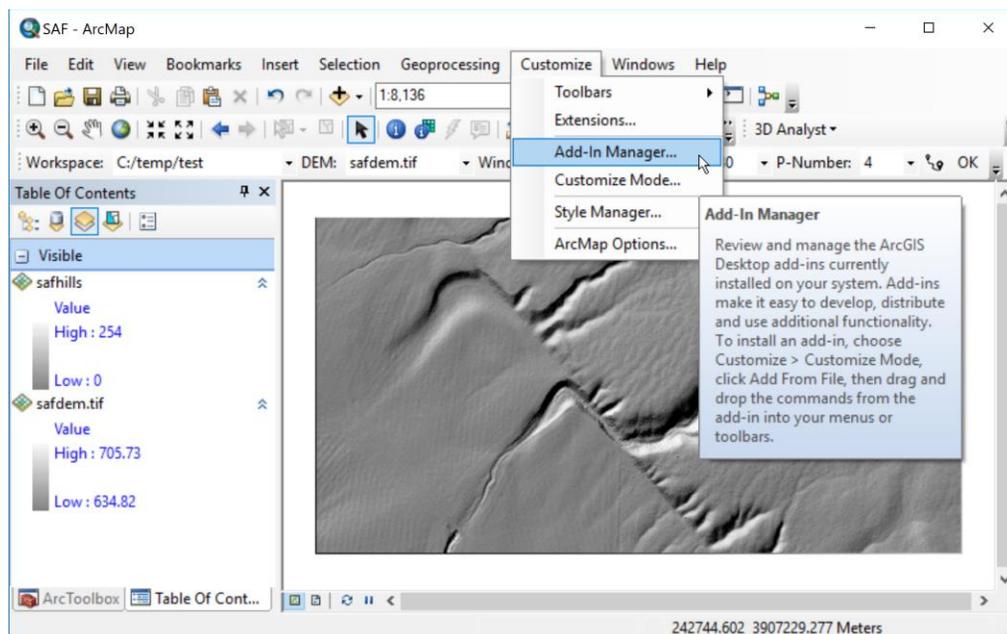


Figure 1. ArcMap Add-in Manager.

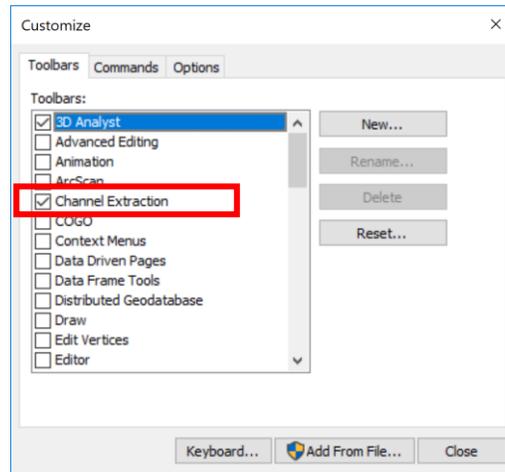


Figure 2. Add-in Manager Customize window.

In the Customize window (Figure 2), check “Channel Extraction” and click “Close”. The Channel Extraction toolbar should appear (Figure 3).



Figure 3. Channel Extraction toolbar.

3. Application Demonstration

You can dock the toolbar to ArcMap, and add the two raster files “safdem.tif” and “safhills.tif” to ArcMap. On the toolbar in Figure 3, the “Workspace” is the output folder (**Note:** this should be an empty folder you have created). You can select a raster as the input DEM (**Note:** safdem.tif is the DEM, and safhills.tif is a hillshaded DEM for visualization only). You should select safdem.tif as the DEM, but you can use safhills.tif as backdrop, see Figure 1). The Window Size is used to search for local minimums in the DEM, and the unit of Window Size is the same as the unit of the input DEM. P-Length is the length of cross profiles with the same unit as the DEM, and P-Number is the number of cross profiles to be generated along the longitudinal profile.

After clicking the Draw tool before the OK button, you can click at a location near the start point of the channel. You will see the coordinates of the start point (Figure 4). Then you can click at a location near the end point of the channel to get the coordinates of the end point (Figure 5). If necessary, you can repeat this process many times for the same channel, just to make sure the order of the points is always “start”, “end”, “start”, “end”... The locations of the start and end points do not have to be exactly on the channel (because the program will search for the lowest points near these two points), but you should try to define the start and end points as close to the channel as possible. Then click OK to run the program. You can also go to the Geoprocessing menu of ArcMap and select Python to open the Python window, so that run-time errors in the Python code can be detected. When the program finishes, you will see a message, and the output tables and feature classes will be added to ArcMap (Figure 6). The tables, feature classes, rasters, and the summary text file “results.txt” are saved in the output folder. Figure 7 is the text file summarizing the results. Figure 8 is the attribute table of the random sampling points along the channel polyline for accuracy assessment. The error is automatically calculated for each point. Figure 9 shows the extracted channel polyline, cross profile locations, and random sampling points for accuracy assessment. You can also add the output rasters to ArcMap. Figure 10 shows the thinned channel (green cells) and cells removed by mathematical morphological operations (red).

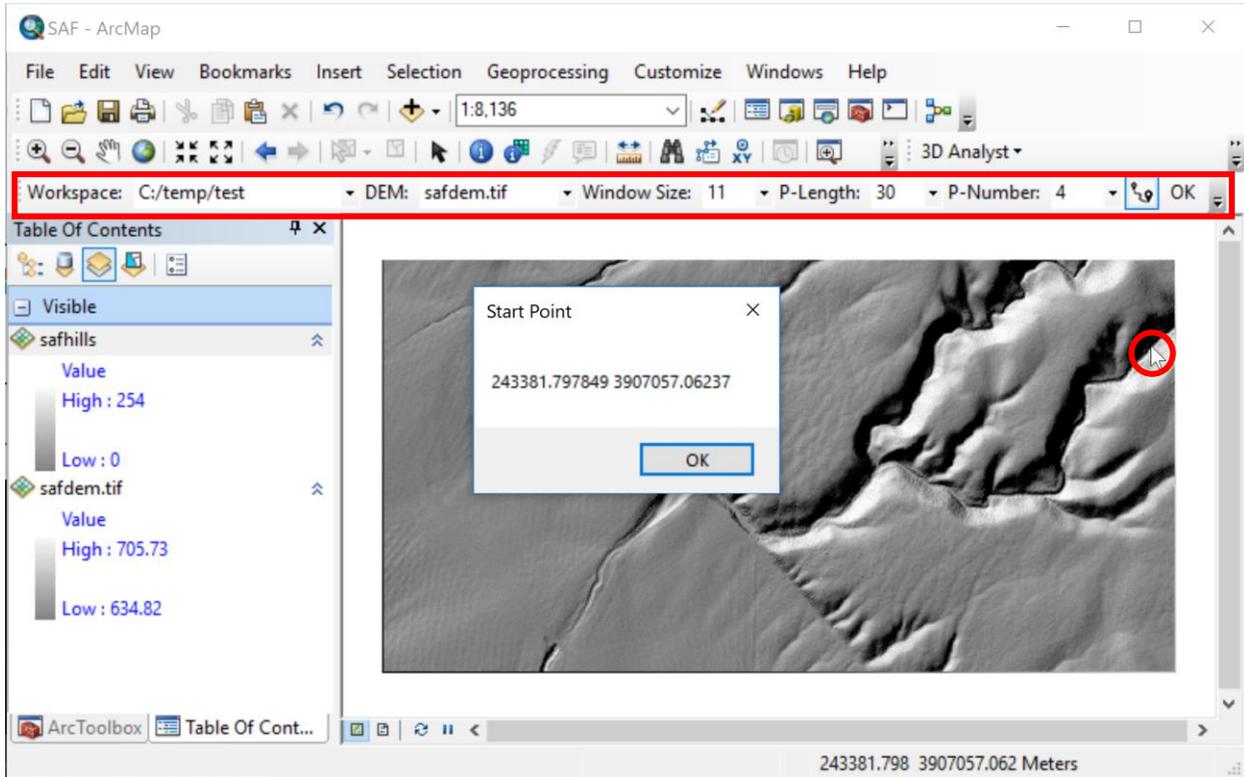


Figure 4. Start point of the channel.

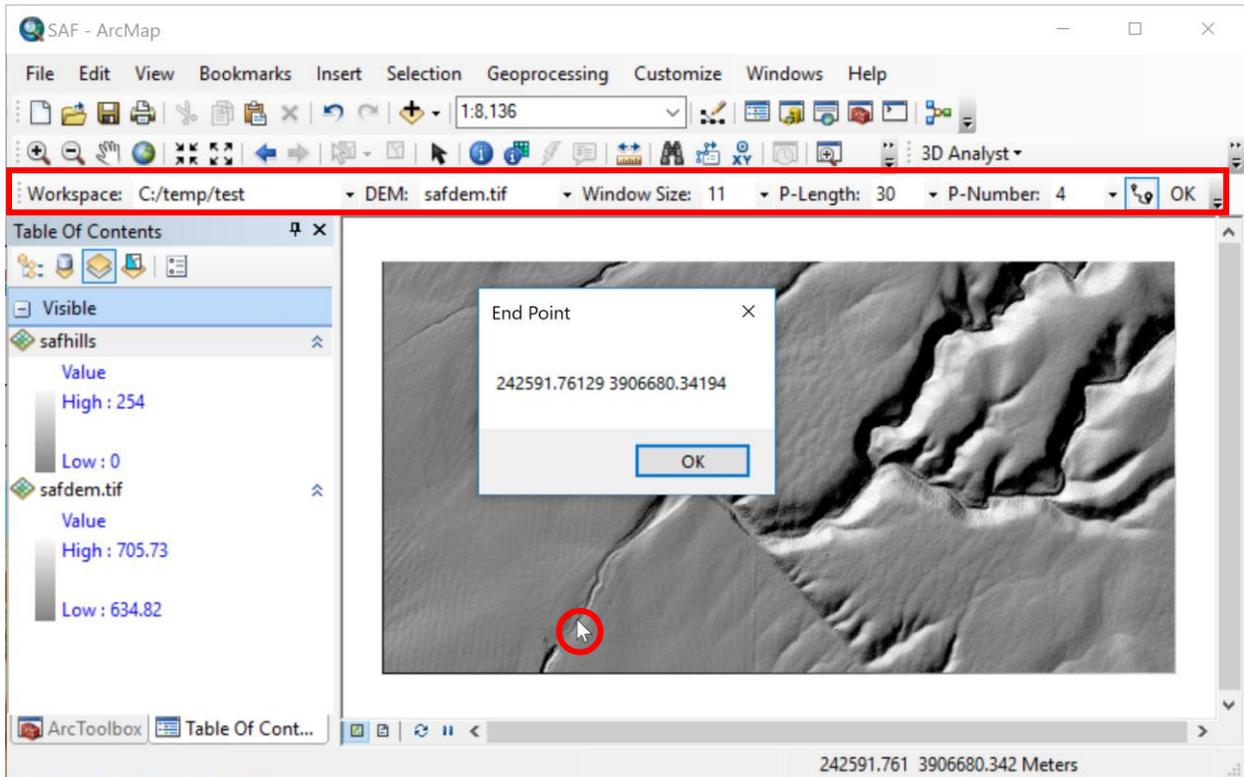


Figure 5. End point of the channel.

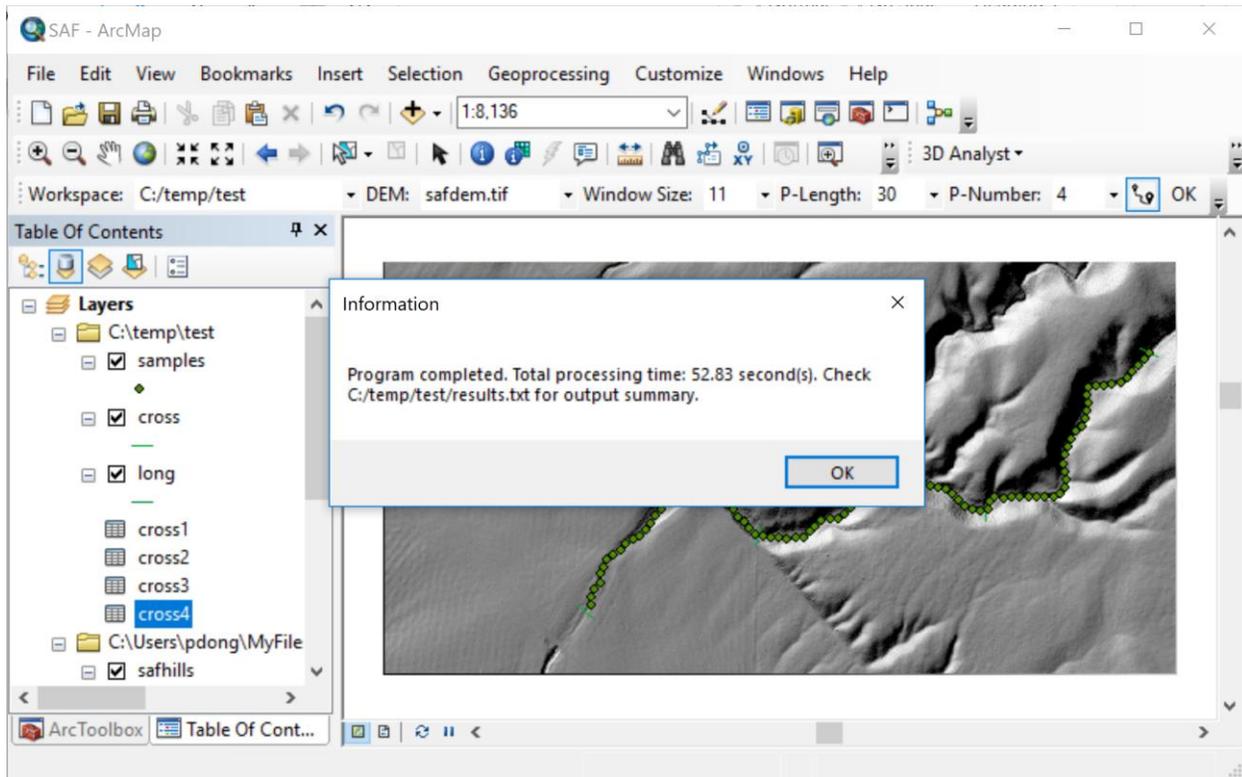


Figure 6. Channel extraction results.

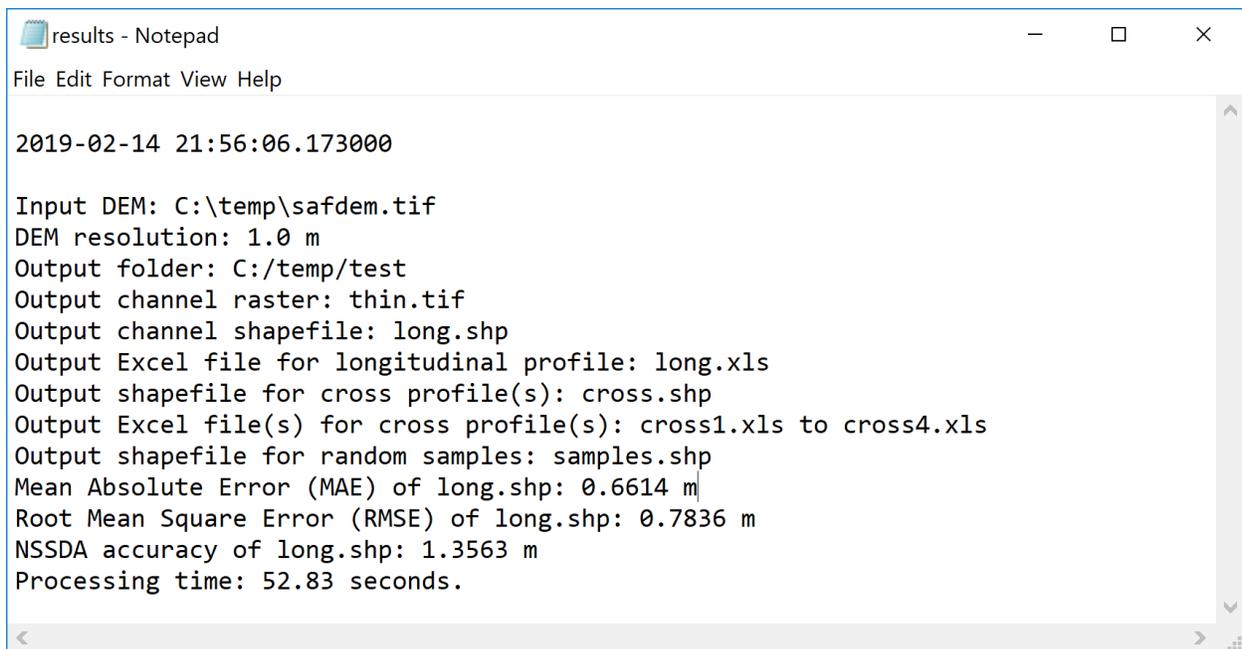


Figure 7. Summary report.

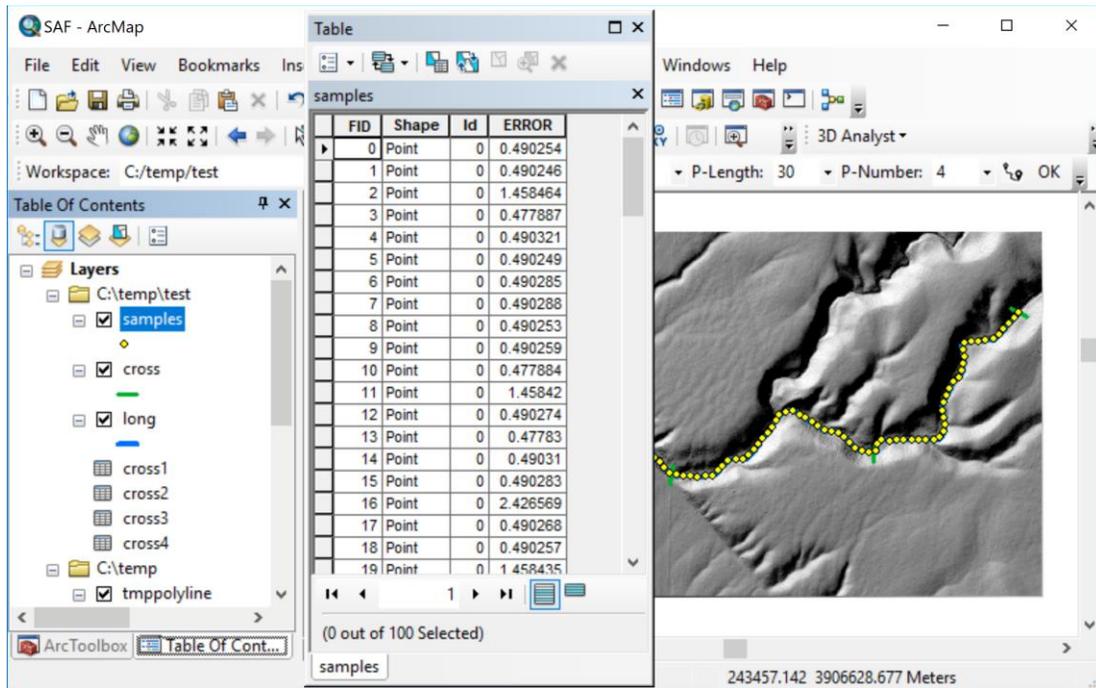


Figure 8. Attribute table of random sampling points along the channel for accuracy assessment.

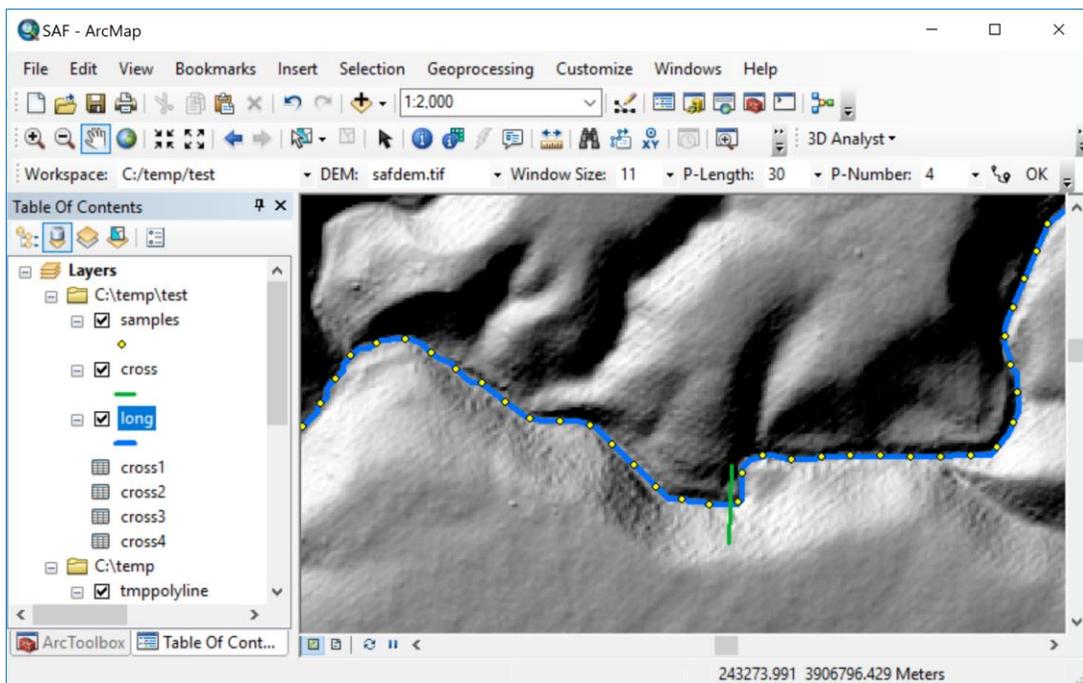


Figure 9. Channel polyline (blue), cross profile location (green), and random sampling points (yellow).

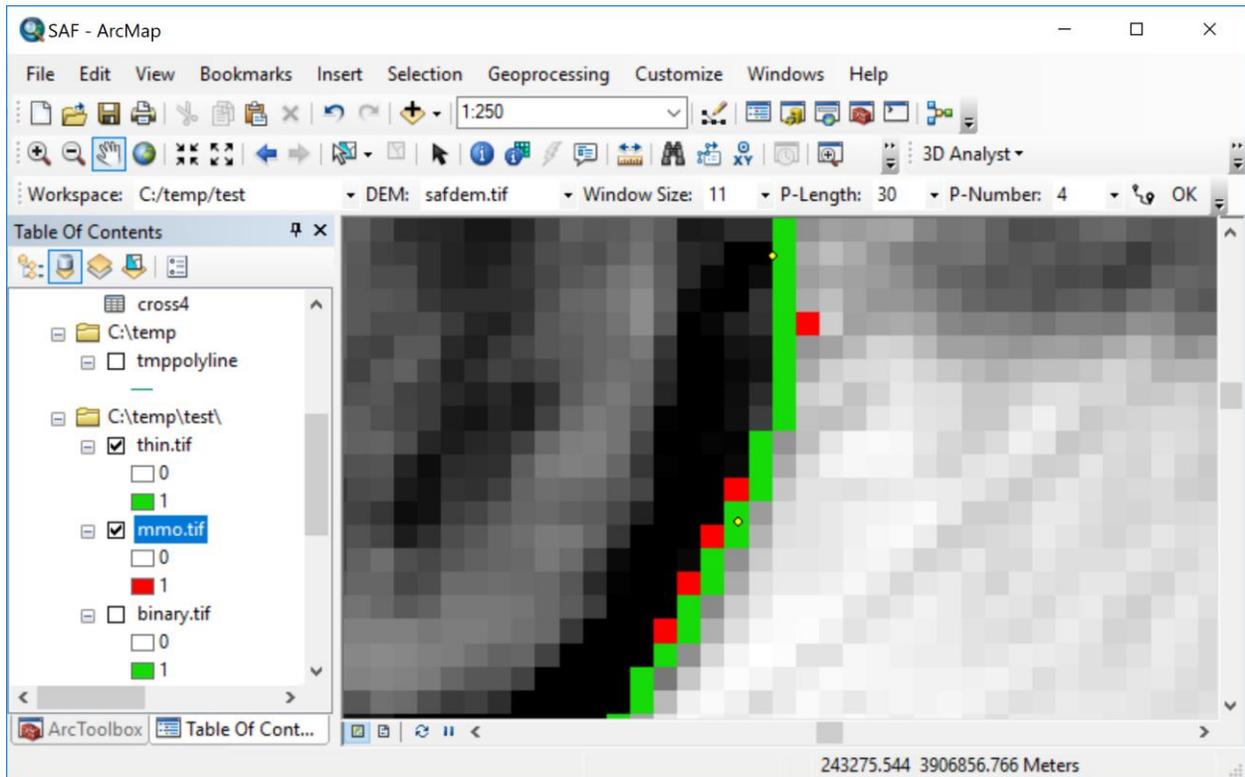


Figure 10. Thinned channel cells (green) and removed cells (red) after mathematical morphological operations.

4. Disclaimer

The Channel Extraction Python add-in toolbar for ArcGIS 10.7 and 10.7 is provided "As Is", without warranty of any kind, express or implied, including but not limited to the warranties of merchantability, fitness for a particular purpose and non-infringement. In no event shall the authors or copyright holders be liable for any claim, damages or other liability, whether in an action of contract, tort or otherwise, arising from, out of or in connection with the software or the use or other dealings in the software.

5. Recommended Citation

Dong, P., Zhong, R., Xia, J., and Tan, S., 2020. A semi-automated method for extracting channels and channel profiles from lidar-derived digital elevation models. *Geosphere*. (in press).