Sediment Accumulation Risk Model (SARM) - User Guide

Background

The Sediment Accumulation Risk Model (SARM) is an ArcGIS Pro v3 Python Toolbox containing a set of tools for generating NDVI-erodibility weighted flow pathways at a user-specified threshold, testing accumulation thresholds for generating pathway outputs, generating sediment accumulation risk along those pathways and identifying high risk locations. It has been designed for use in smaller agricultural sub-catchments and performs best in headwater locations.

Pre-requisites and inputs

- Shapefile (.shp) and TIF raster (.tif) inputs should be used.
- All inputs should be stored in the same workspace folder.
- All tools must be run in order because Tools 2, 3 and 4 use outputs from the previous tool.

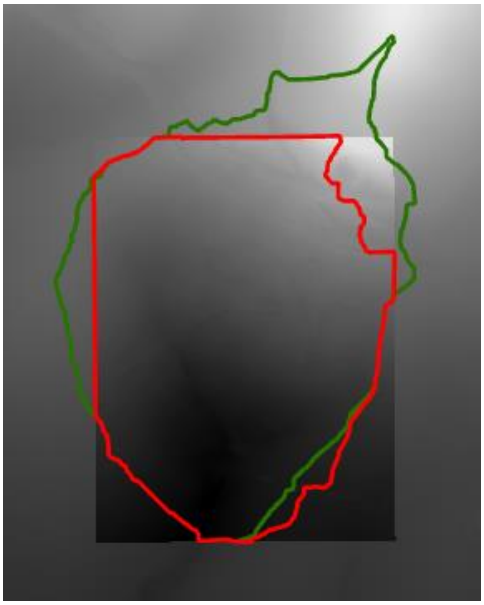
Tool 1 - Generate Initial Flow Pathways

- *Input DTM:* This must be a Digital Terrain Model (Raster Dataset) of the broad approximate interest area saved in a folder (where all input and output files are stored).

Tool 2 - Generate Erodibility-Weighted Flow Pathways

- *Workspace Folder*: Set this to the folder where all input and output files are stored (i.e. where the input DTM is saved).
- *Input Pour Point Data*: After inspection of the initial flow pathways in Tool 1, the user must create a point shapefile containing their (single) pour point from which they wish to generate their watershed and save this in the input workspace folder. The pour point should be plotted as close to the flow pathway as possible.
- *Input NDVI*: This must be a NDVI (Raster Dataset) of the approximate area of interest saved in the input workspace folder.
- *Source NDVI Resolution*: Specify the resolution of the input NDVI in metres.
- *DTM Resolution*: Specify the resolution of the input DTM in metres.

NB This tool may produce incorrect outputs or fail if the generated watershed is incomplete and unnaturally 'squared off' (i.e. it is cut off by a limited input DTM extent). After running Tool 2, check the 'Watershed_poly.shp' output to ensure it is correct. If it is not, the input DTM should be extended and this tool re-run. See the example image below to compare the watershed outputs from using a smaller DTM input (red outline) against using a larger DTM input (green outline), which produces a complete watershed:



Tool 3 - Determine Accumulation Threshold

- *Workspace Folder*: Set this to the folder where all input and output files are stored.
- *Accumulation Threshold*: Specify the desired flow accumulation threshold (integer) value to be used to define the pathways.

Tool 4 - Identify High Risk Points of Accumulation

- *Workspace Folder*: Set this to the folder where all input and output files are stored.
- *Accumulation Threshold*: Specify the desired flow accumulation threshold (integer) value to be used to define the pathways.

Outputs

- {threshold} is the user-specified accumulation threshold value.

Tool 1 - Generate Initial Flow Pathways

- *DTM_filled.tif*: result of filling the input DTM raster.

Tool 2 – Generate Erodibility-Weighted Flow Pathways

- *Watershed_poly.shp*: result of generating the watershed and converting to polygon.
- *DTM_clip.tif*: result of clipping the filled DTM to the generated watershed.
- *NDVI_erodibility.tif*: result of preparing the inverse NDVI erodibility weight layer.
- *Flow_Dir.tif*: result of performing the flow direction operation within the generated watershed (replaces the earlier flow direction output generated for the wider general area of interest).
- *W_FA.tif*: result of performing the flow accumulation operation using the NDVI erodibility weight raster.

Tool 3 - Determine Accumulation Threshold

- *Flow_Acc_fat_{threshold}.tif*: result of applying a threshold value to the weighted flow accumulation output.
- Pivot_*{threshold}.*csv: pivot table containing the number of pathways of each stream order number.

Tool 4 - Identify High Risk Points of Accumulation

- *Flow_Acc_stream_lines_{threshold}.shp*: result of converting the weighted thresholded flow accumulation raster pathways to lines.
- *Points_{threshold}.csv*: final table output containing all pathway points with path IDs, point IDs, stream order numbers, elevation, slope, NDVI, accumulation and accumulation increase values, with high risk pathway points identified.
- *Points_{threshold}.shp*: final output layer containing all pathway points and the same attributes as output CSV. No data values in the attribute table are expressed as -9999.