

USING THE FLOW ACCUMULATION (FAM) TOOL

This geoprocessing tool for ArcGIS Pro 3.0 was created to assist users in the development of a flow accumulation model. It was designed to function with high spatial resolution digital terrain model (DTM) data like that created from lidar. To use this tool, first download it from https://giscenter.isu.edu/research/Techpg/FEMA_DOS/ZIP/FlowAccumulationModel.zip

This tool will allow you to create a flow accumulation layer for any area of interest (AOI) polygon specified when running the tool. The tool will also help determine the coverage of DTM surface data within the AOI. Ideally, the AOI will be completely covered by the DTM (1.0 or 100%).

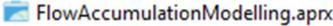
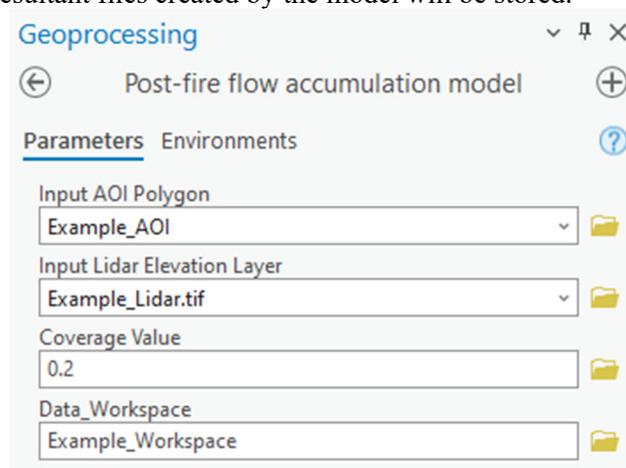
1. After downloading the `FlowAccumulationModel.zip` file from ISU's GIS Center, unzip the file into an appropriate destination location.
2. Once unzipped, open the `FlowAccumulationModel` folder¹.
 - a. Within this folder you will see many files. The only file we are concerned about for now is called `FlowAccumulationModelling.aprx`.

 - b. Open this file by double clicking it
3. ArcGIS Pro will launch and open the `FlowAccumulationModelling.aprx` file.
4. You should see the `SourceData` map.
 - a. Explore the `Example_AOI` (Area of Interest) and the `Example_Lidar.tif` layers. Note: in this example, 100% of the `Example_AOI` polygon is covered by the `Example_Lidar` layer (**figure 1**). This may not always be the case however though it does represent the ideal scenario.



Figure 1. The example Area of Interest polygon and lidar-derived DTM

¹ To learn more about the overall process, see the `Hillslope_flow_accumulation_example.pdf` located in the `FlowAccumulationModel` folder. This documentation and overall methodology was created by the USDA Forest Service.

5. Open the Catalog pane.
 - a. Expand Toolboxes
 - b. Expand the FlowAccumulationToolbox
 - c. Open the Post-fire flow accumulation model tool.
6. To run the example data, set the inputs as follows:
 - a. Input AOI Polygon: Example_AOI
 - b. Input Lidar Elevation Layer: Example_Lidar.tif
 - c. Coverage Value: 1
 - i. This value is the coverage percentage threshold. Input a numerical value between 0 and 1. For example if I want my LiDAR layer to cover at least 55% of the input AOI polygon, this parameter would have a value of 0.55. For this example, we are using “1” because 100% of the AOI is covered by the input Lidar layer.
 - d. Data_Workspace: Example_Workspace
 - i. This parameter is the destination workspace in which all intermediary and resultant files created by the model will be stored.



- e. Click Run
7. The model will complete in approximately three minutes depending on the speed of your workstation. The Flow Accumulation Model will clip the DTM using the AOI polygon, fill the resulting raster to eliminate or reduce the incidence of pits, and then run the accumulation model, subsequent zonal statistics, and summary reports. Processing time is dependent on input file sizes.
8. Once completed, return to the Catalog pane
 - a. Expand the Example_Workspace folder.
 - b. Notice a new raster layer has been created. It is named FlowAccumulation_Con[DATETIME].tif. This is the final result of the tool and is ready for further use.
 - c. You should also see the model has created an excel spreadsheet and CSV file containing the results of this analysis. There is no difference between these files' data and only the format differs. Like the output raster layer, these table names also contain a data and timestamp suffix. This is done to allow you to run several iterations of the model without worry of overwriting files.
9. From Windows File Manager, navigate to this Example_Workspace folder
10. Double-click the SummaryData[*].xls file (NOTE: if Excel is not installed on your computer, you may use the SummaryData[*].csv file).
 - a. Locate the PCT column. This value is the proportion of the maximum observed flow for the flow accumulation model.
 - b. Using the example data, the resulting value should be 0.547 or 54.7%

Now that you are familiar with this model, you can apply it to your own data.

11. Add a new AOI polygon and DTM raster to the ArcGIS Pro FlowAccumulationModeling project.
12. View these new data in the Source Data map to ensure both layers appear as expected.
13. Then, run the model again.
 - a. Set the Input AOI Polygon to your new polygon feature class. This could be a shapefile or polygon feature class within a geodatabase and may represent a wildfire area, watershed basin, or other polygon area.
 - b. Set the Input Lidar Elevation Layer to your new raster surface layer.
 - c. The output Data_Workspace can be changed also if you wish.

END