

Mapping Streams in Baspa Basin

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Table of Contents

A. Summary	4
B. Process	5
1. Satellite data download	5
2. Using Hydrology tools in ArcMap	5
i. Applying Fill tool.	5
ii. Using Flow Direction tool.	5
iii. Using Flow Accumulation tool.	6
iv. Creating PourPoint feature class.	6
v. Applying Watershed tool.	6
vi. Raster conversion to vector, co-ordinate system re-projection for area and perimeter calculation	7
vii. Clipping, Raster Calculation and Raster to Polyline for presentation	7

List of Tables

Fig. 1. Streams in Baspa Basin	4
Fig.2. Aster DEM of Baspa Basin in ArcMap	5
Fig. 3. PourPoint Feature shown overlaying DEM raster.	6
Fig. 4. Watershed area of Baspa Basin	6
Fig. 5. Attribute table showing area and perimeter of Baspa Basin.	7

A. Summary

Mapping Streams in Baspa Basin

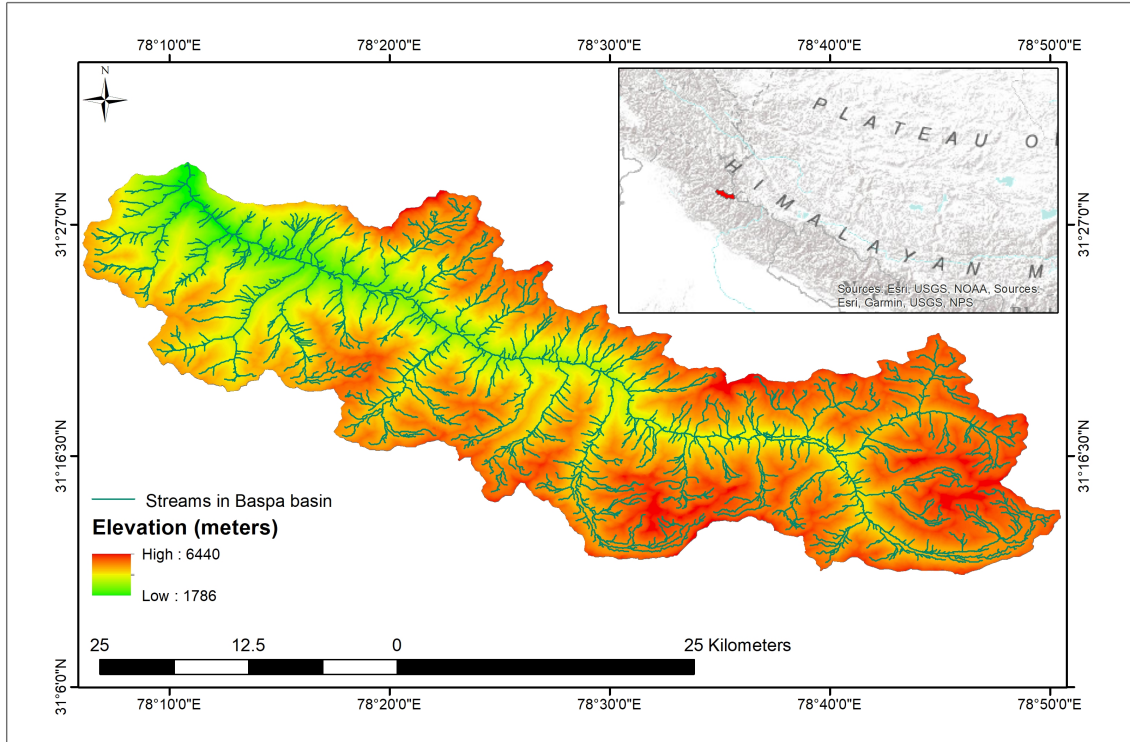


Fig. 1. Streams in Baspa Basin

This project uses ASTER Digital Elevation Model (DEM) accessed from earthdata.nasa.gov to process it with series of hydrological tools of ArcMap software and produce comprehensive map of river streams in Baspa Basin of Himachal Pradesh, India. To map all the streams of Baspa Basin, Fill tool was used for data consistency, then Flow Direction tool was used identify slopes of surrounding elevation points, further Flow Accumulation tool was applied which processes multiple flow models to determine flow accumulation at any given point. Finally, we identified pour point which determines the contribution area and it was subsequently processed through Watershed tool to layout streams in the form of raster. The raster is then converted to vector file (shape file) and subsequently plotted it on map as shown in the figure.

B. Process

1. Satellite data download

The satellite data was downloaded ASTER DEM from Earth Data website which is NASA webpage (<https://search.earthdata.nasa.gov/search/>). Specific co-ordinates in decimal degrees 31.4255° and 78.2650° were entered and Aster Global DEM V003 was downloaded in TIF format.

2. Using Hydrology tools in ArcMap

The following view shows Aster DEM of Baspa Basin in ArcMap software with values ranging from 1103 to 6727. This represents the lowest and highest elevations in the dataset. The lowest elevation is 1103 meters above the sea level and highest elevation is 6727 meters above the sea-level.

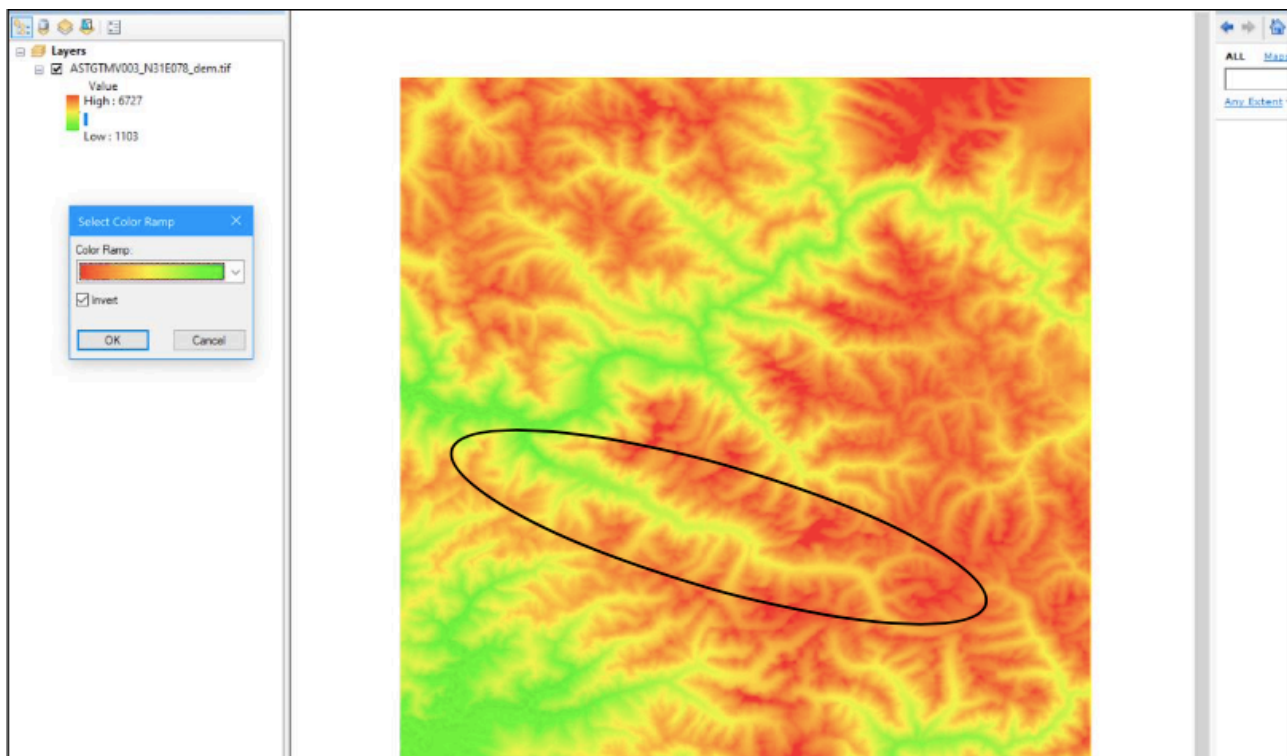


Fig.2. Aster DEM of Baspa Basin in ArcMap

i. Applying Fill tool.

Fill tool is available in the Hydrology tool set of ArcMap. It is used to remove small imperfections in the data that may have been present in DEM. With this tool, sinks are identified that have undefined drainage direction.

ii. Using Flow Direction tool.

Flow Direction tool is applied on the raster created from the previous step. The tool creates flow direction raster from each cell to its downslope neighbour with use of multiple modelling algorithms. The output at each cell level is determined by the values assigned to

its neighbours. The flow is considered towards the cell having lowest number compared to the cells surrounding it.

iii. Using Flow Accumulation tool.

The resulting raster of previous step is then processed through Flow Accumulation tool. This tool accumulates the weights of all the cells that flows into each downward slope cells. It supports three algorithms to achieve it.

iv. Creating PourPoint feature class.

This is a simply point shape file having a point plotted at co-ordinate 31.4987 and 78.18090 of Baspa Basin.

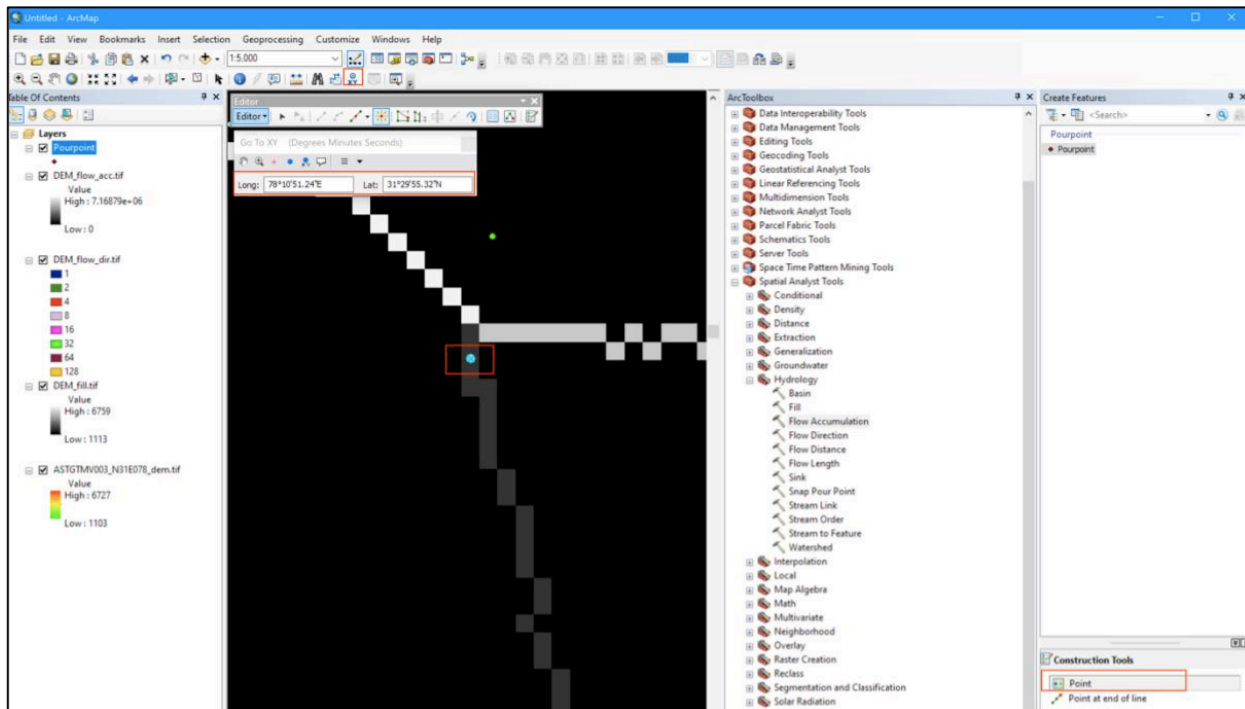


Fig. 3. PourPoint Feature shown overlaying DEM raster.

v. Applying Watershed tool.

This steps delineates watershed using the pour point created. It is used to find the total contributing area resulting from the flow directions identified. This defines the total boundary area of the map with considering to the flow from the pour-point.



Fig. 4. Watershed area of Baspa Basin

vi. Raster conversion to vector, co-ordinate system re-projection for area and perimeter calculation

In this step, watershed raster is converted to boundary polygon using Raster to Polygon tool. The existing co-ordinate system for the vector file created needs to be projected to WGS 1984 UTM Zone 44N for area and perimeter calculation.

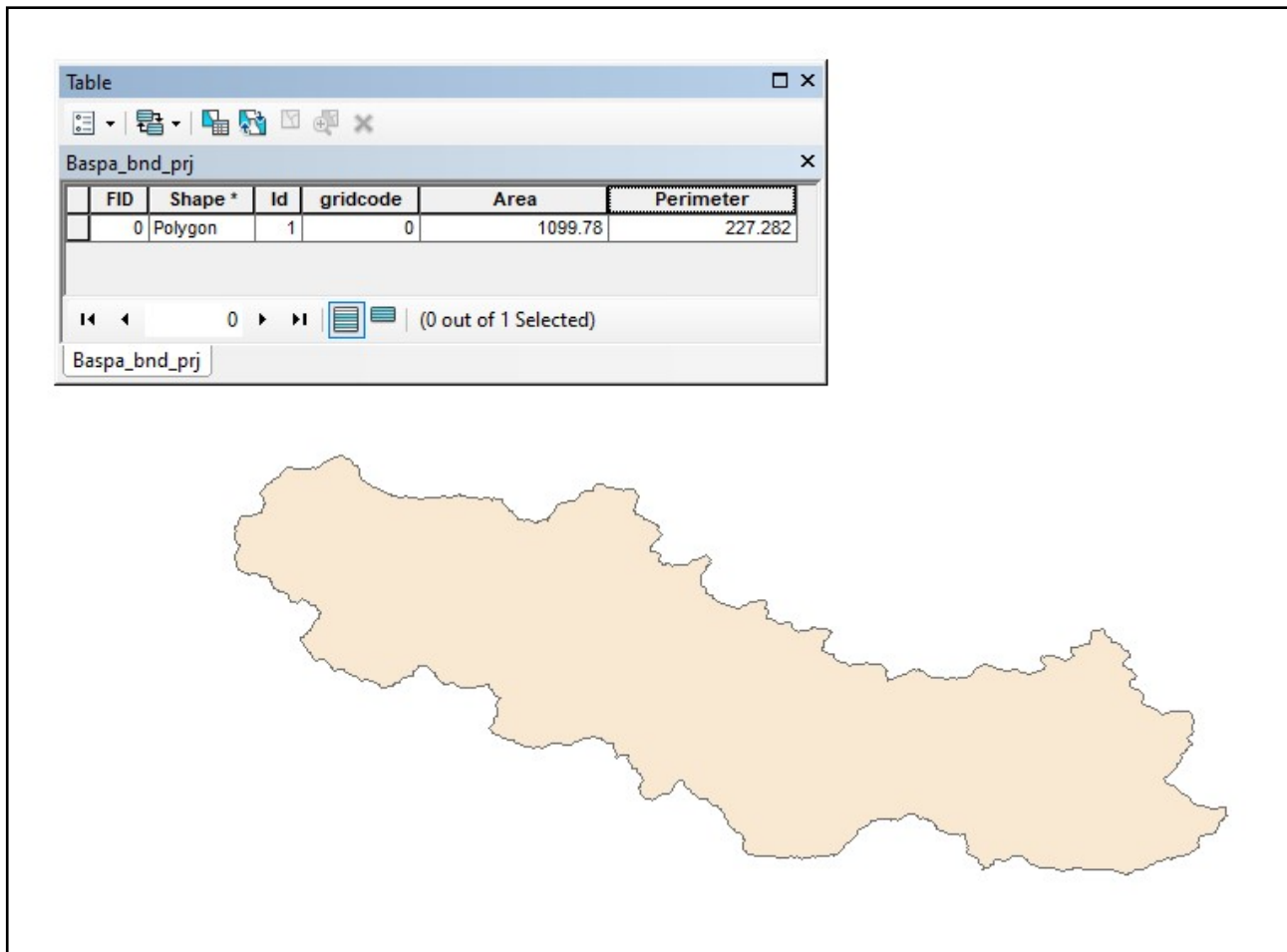


Fig. 5. Attribute table showing area and perimeter of Baspa Basin.

vii. Clipping, Raster Calculation and Raster to Polyline for presentation

To present the stream network of Baspa Basin, Aster DEM raster is clipped as per the boundary polygon determined in previous step. To determine streams on the map, raster calculation is performed with flow accumulation raster with condition of cell values > 300 . Finally, raster to polyline conversion is used to create Baspa Basin streams as polyline on a vector file.

The final exported map with all the components added looks as shown in figure. 1 above.