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Watershed Delineation and Finding Area of Watershed

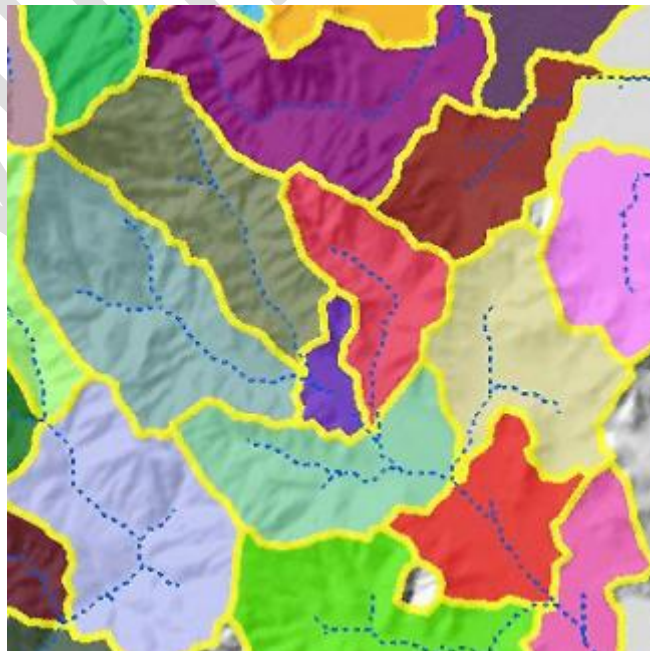
Introduction:

When we talk about the hydrologic cycle and the water budget, we typically talk about these things in terms of watersheds. A **watershed** is an upslope area that contributes water flow as concentrated drainage. This area can be **delineated** from a digital elevation model (DEM)

Watersheds, also known as basins or catchments, are physically delineated by the area upstream from a specified outlet point. Watersheds can be delineated manually using paper maps, or digitally in a GIS environment.

All **watershed delineation** means is that you're drawing lines on a map to identify a **watershed's** boundaries. These are typically drawn on topographic maps using information from contour lines. Contour lines are lines of equal elevation, so any point along a given contour line is the same elevation

Watersheds are topographically defined areas – something like bowls. What we mean by that is that a watershed is separated from neighboring watersheds by high points on the landscape. You can think of a watershed as an area that, if precipitation falling into it was not evaporated back to the atmosphere and did not infiltrate into the soil, all the water in the watershed would run downhill to the same stream.



Watersheds can be delineated from a DEM by computing the flow direction and using it in the [Watershed](#) tool

What is DEM

A **digital elevation model (DEM)** is a digital representation of the land surface elevation with respect to any reference Datum. DEM is frequently used to refer to any digital representation of a topographic surface.

Problem Statement:

To Find Watershed Delineation and Area of Watershed from Digital Elevation Model (DEM) of any Location Using GIS.

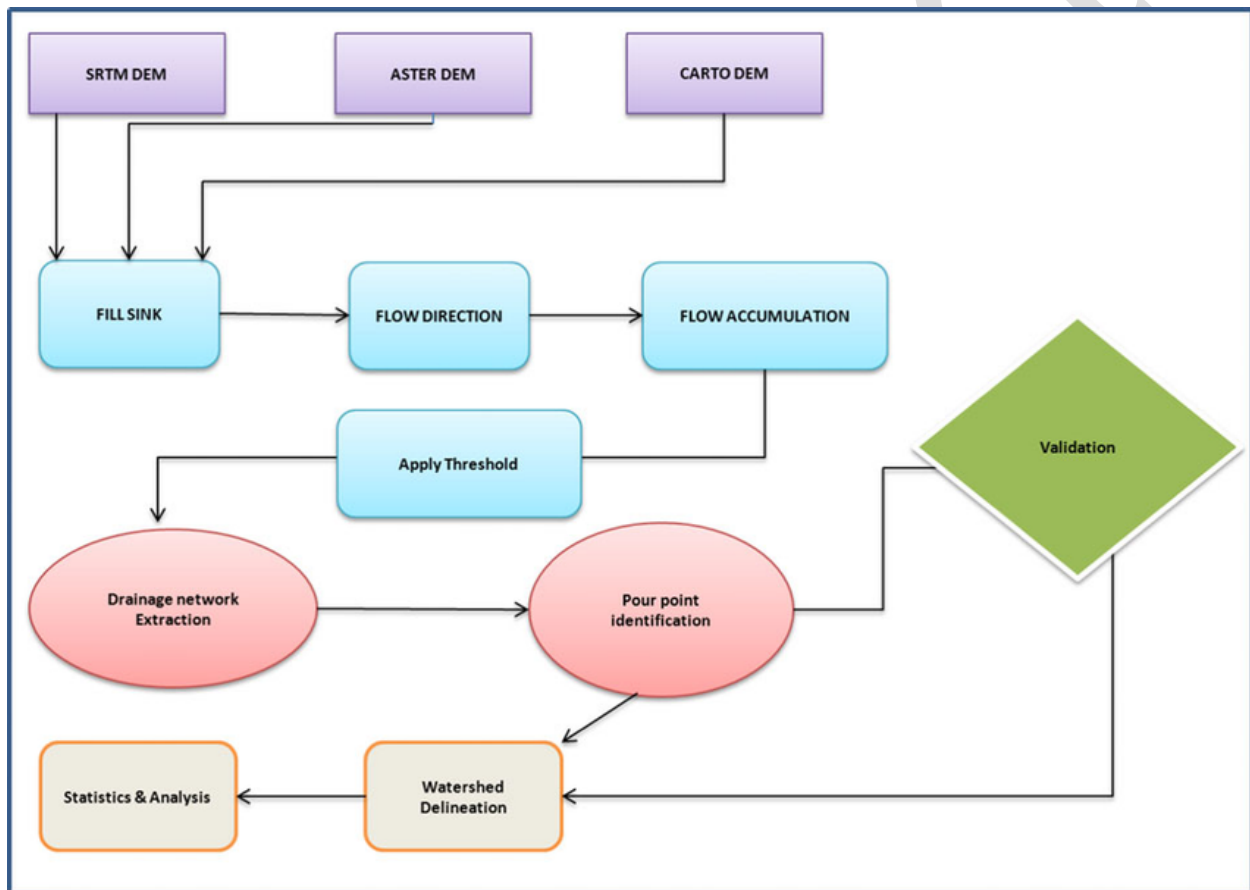
Objectives:

- **Watersheds** are **important** because the surface water features and stormwater runoff within a **watershed** ultimately drain to other bodies of water. It is essential to consider these downstream impacts when developing and implementing water quality protection.
- Learn how to delineate a watershed for a point of interest using a digital elevation model (DEM) and the ArcGIS Spatial Analyst Extension
- Once the watershed is delineated it can then be used to crop out data from other layers (e.g. land cover, area, etc.) that are useful in hydrology

Methodology:

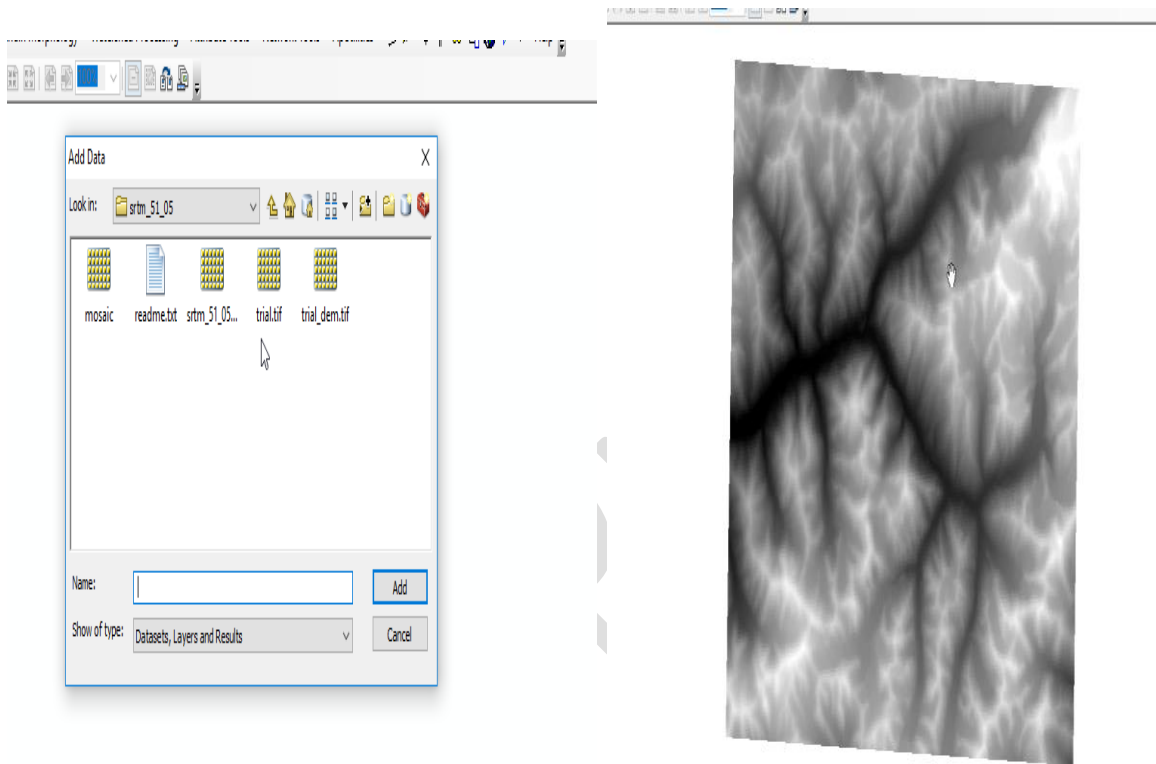
In this project Digital Elevation Model will be used of any Area and we will import it to Arc GIS for Analysis and Results and then we will find Area of Watershed.

The Flow chart shows step by step method of this process.

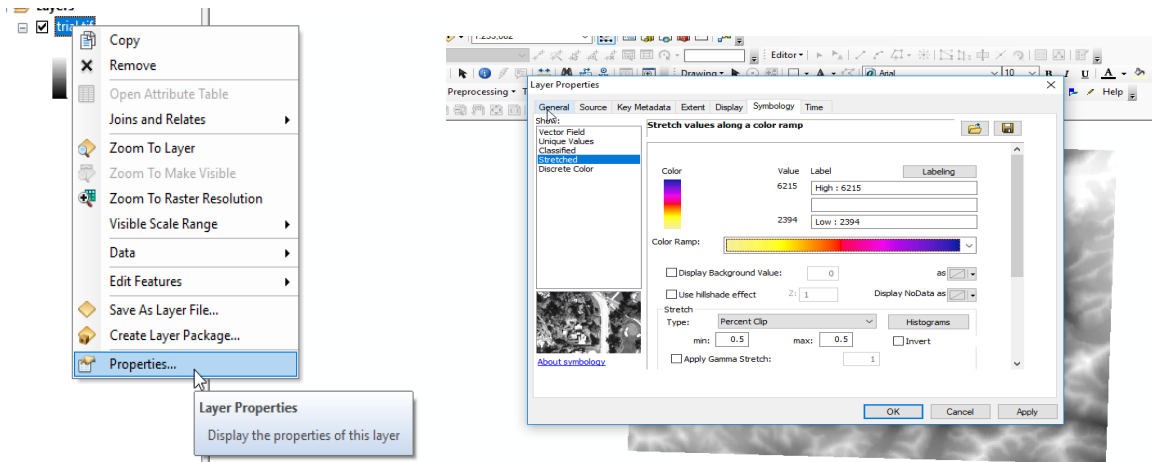


Analysis, Discussion and Results:

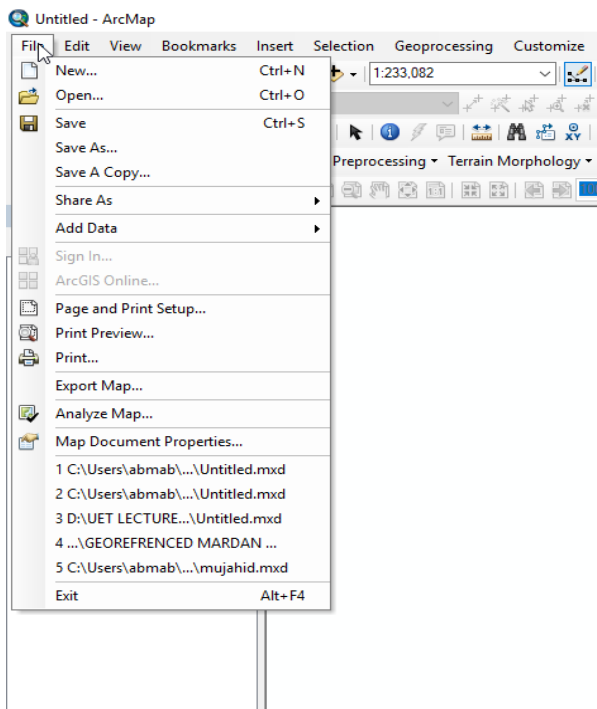
STEP NO:01 Open the Arc GIS and add DEM map to Arc GIS



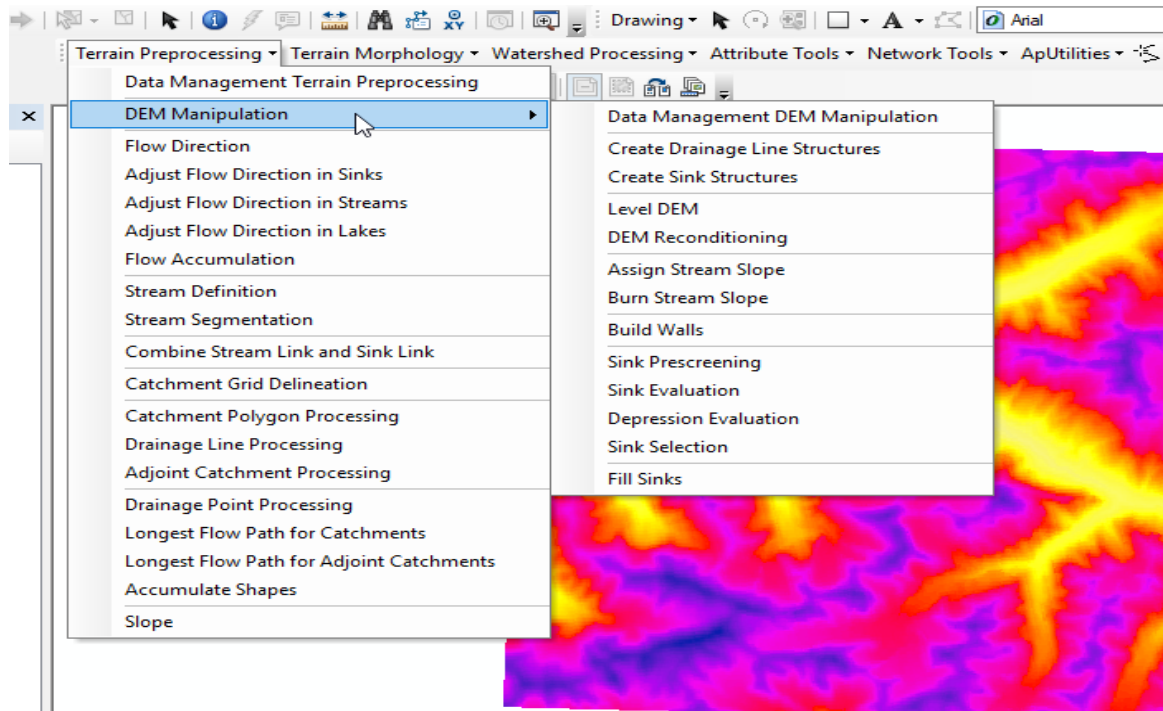
STEP NO:02. Select on properties and change color of DEM from black in white to another visible color.



STEP NO:03. Save the file firstly. And start delineation.

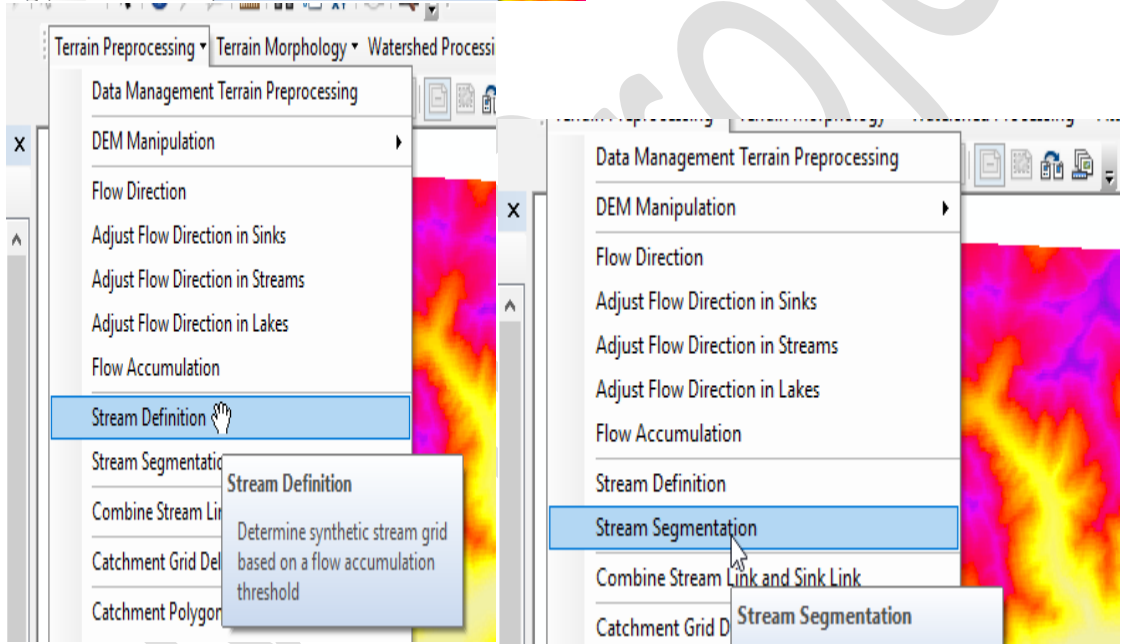
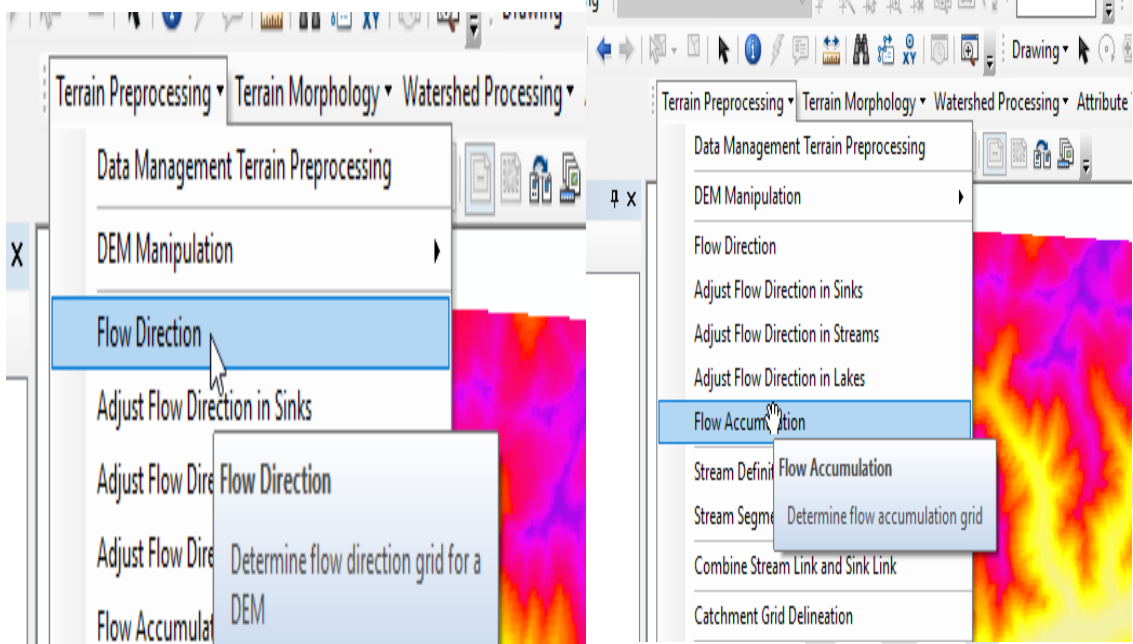


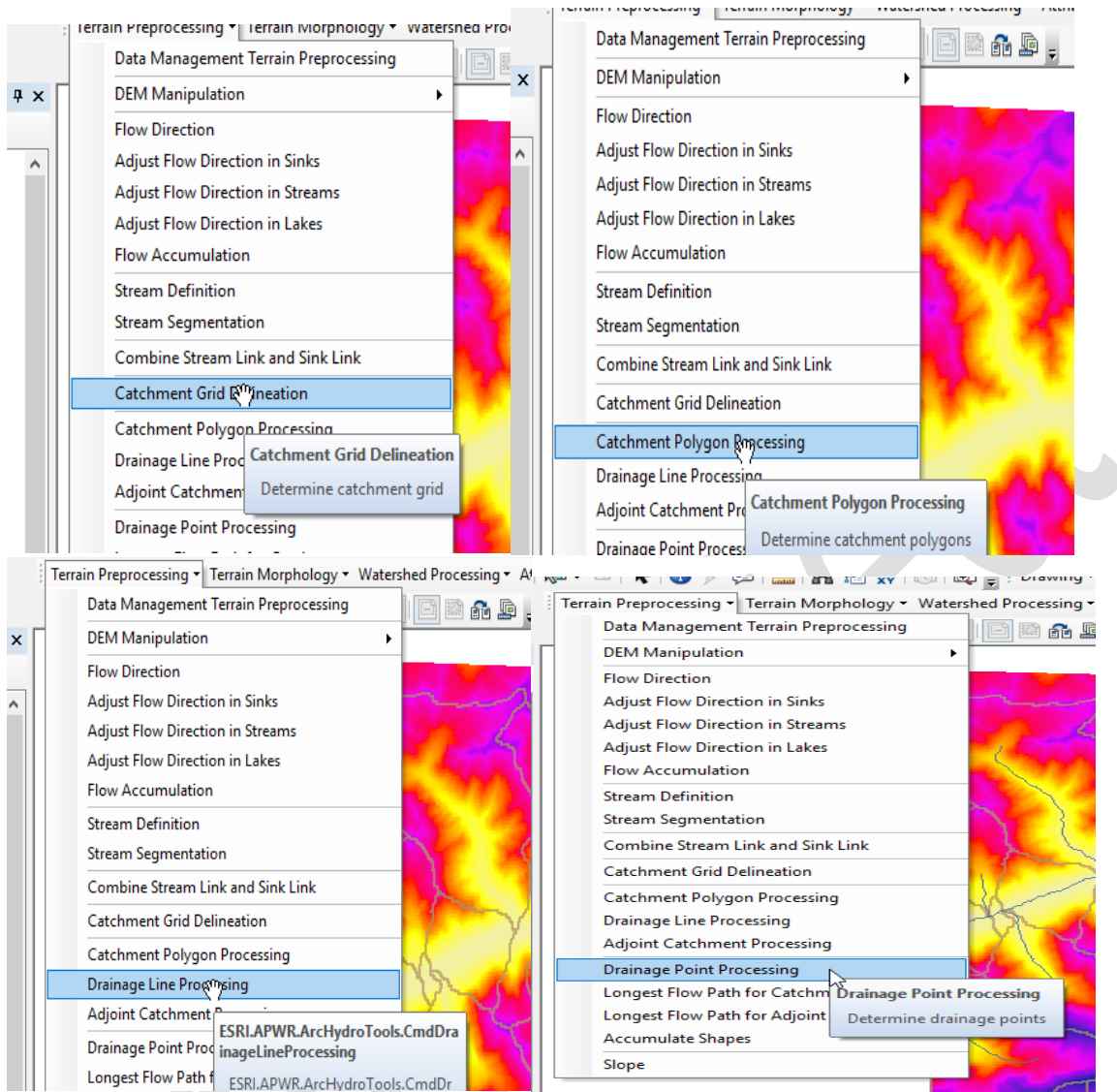
STEP NO:04. Select “terrain Preprocessing” and then Click on “DEM Manipulation” and click on “Fill Sink”.



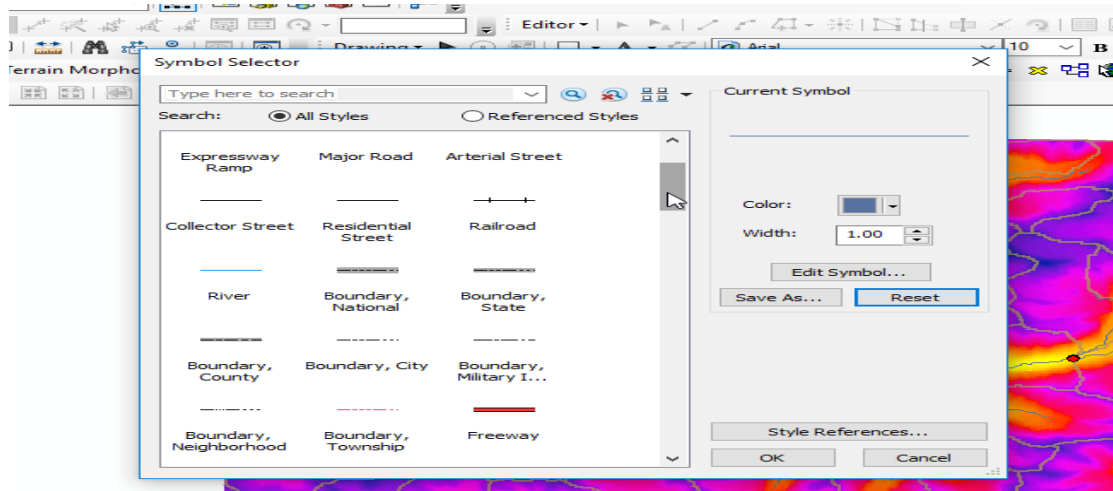
STEP NO:05. Select step by step:

- ❖ Flow Direction
- ❖ Flow Accumulation
- ❖ Stream Definition
- ❖ Stream Segmentation
- ❖ Catchment Grid Delineation
- ❖ Catchment Polygon Processing
- ❖ Drainage Line Processing
- ❖ Drainage Point processing

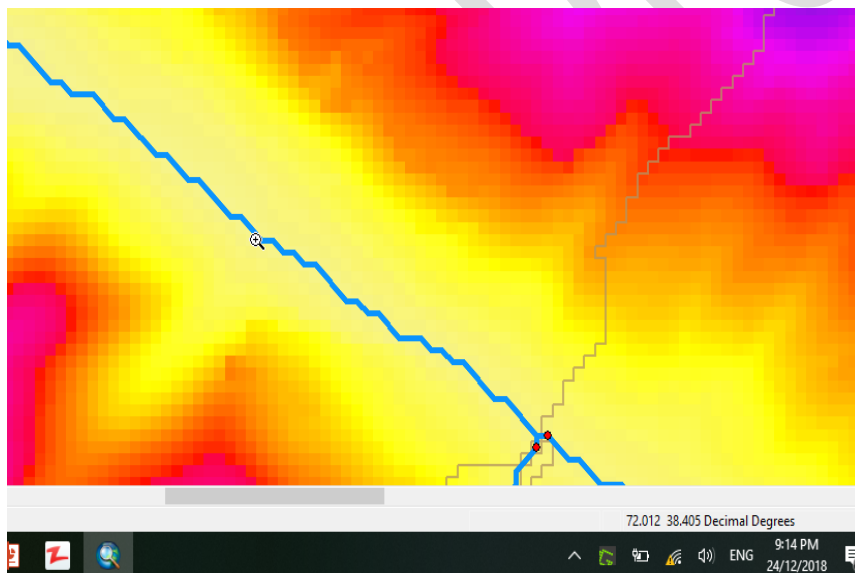




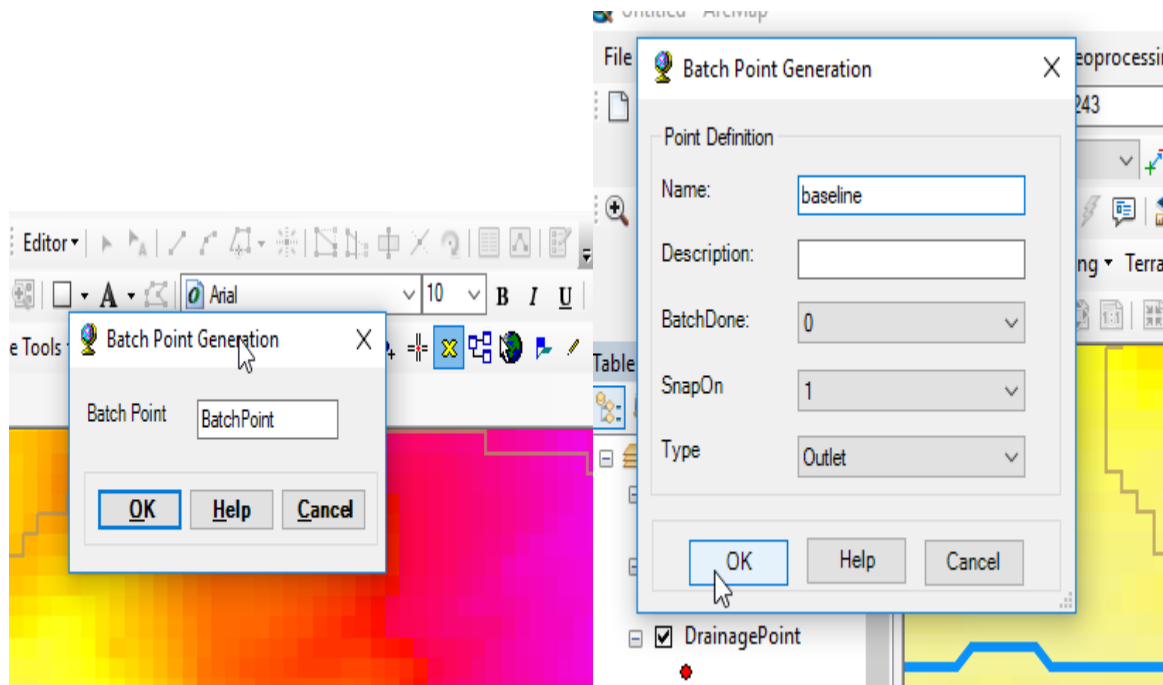
STEP NO:06. Increase the width of drainage line and change the symbol to “River”.



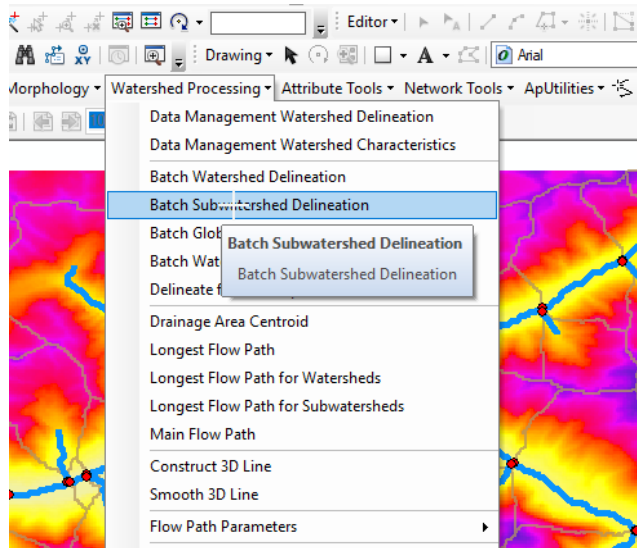
STEP NO:07. Zoom In the specific coordinate (72.012,38.405) .



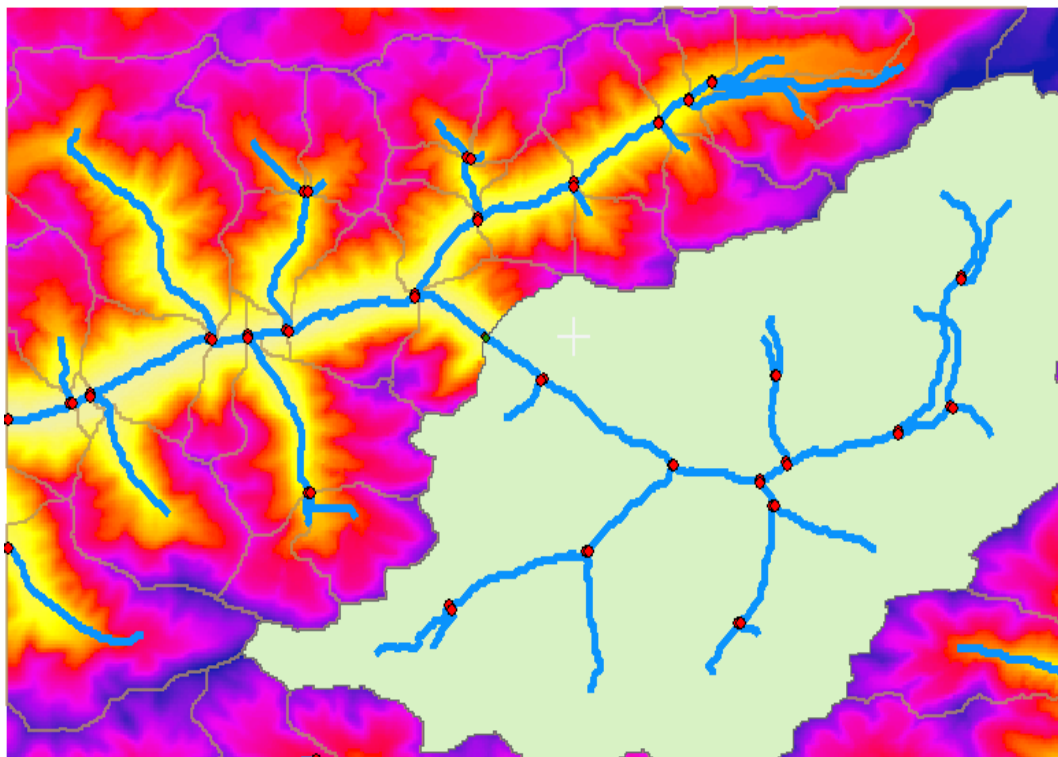
STEP NO:08. Select “batch point generation” from task bar. Give name to batch point. And mark batch point on specific location(coordinates).



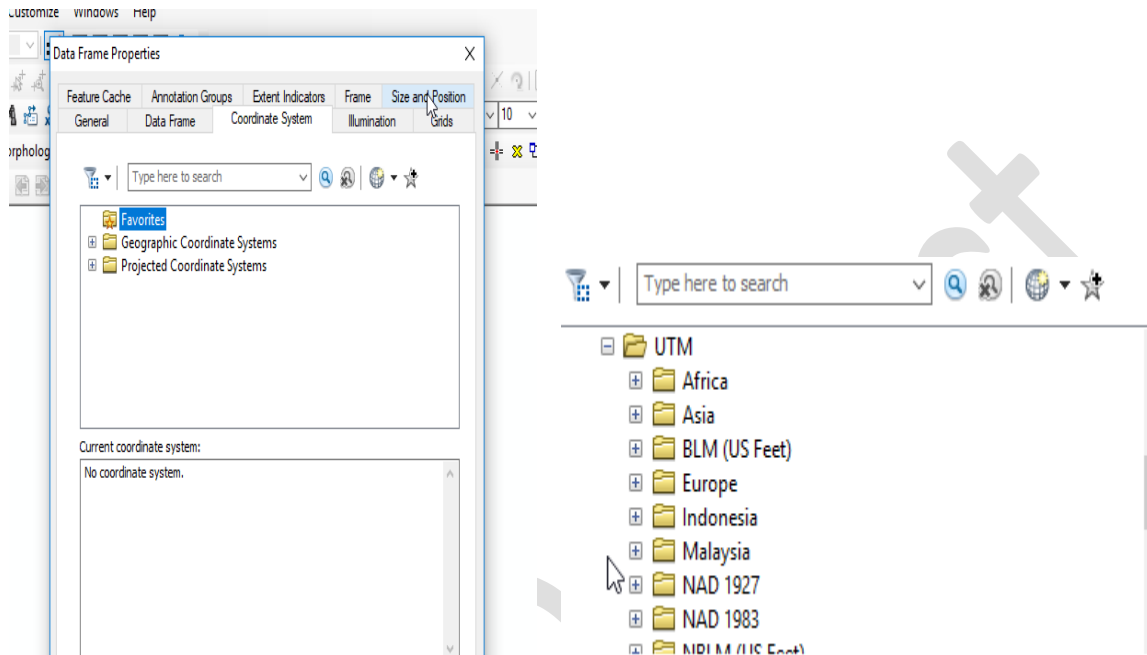
STEP NO:09. Select “Batch Sub watershed Delineation” from Watershed Processing (taskbar).



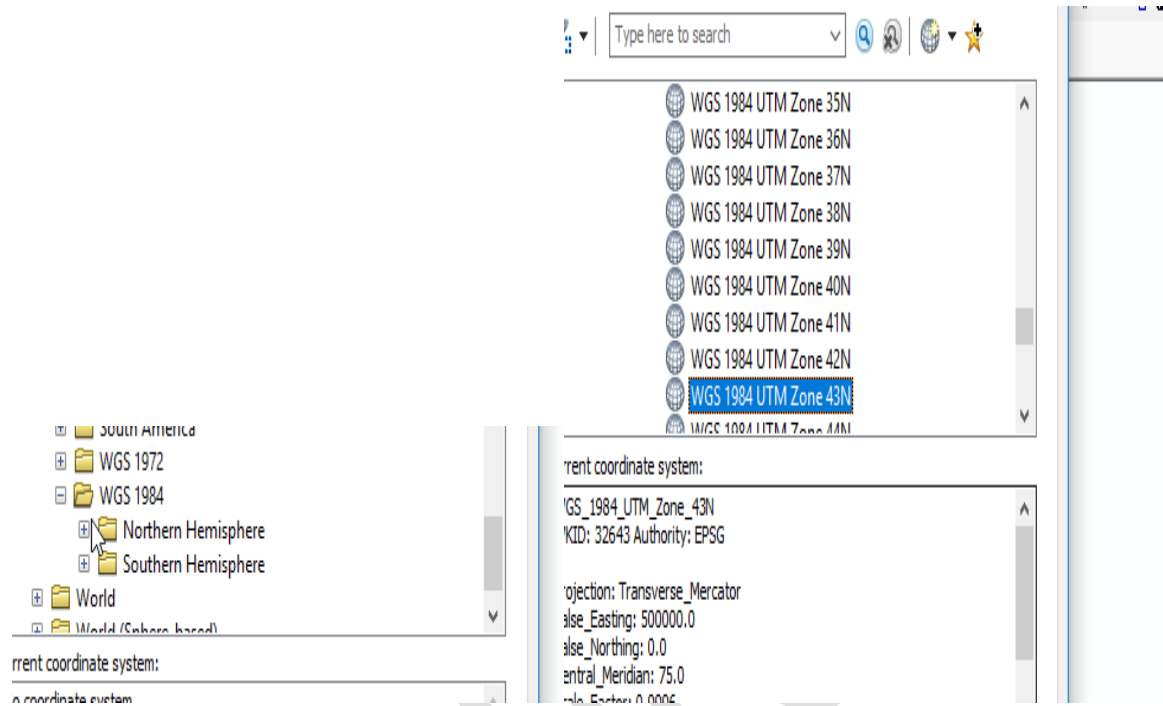
STEP NO:10. Watershed are generating for specific coordinates.



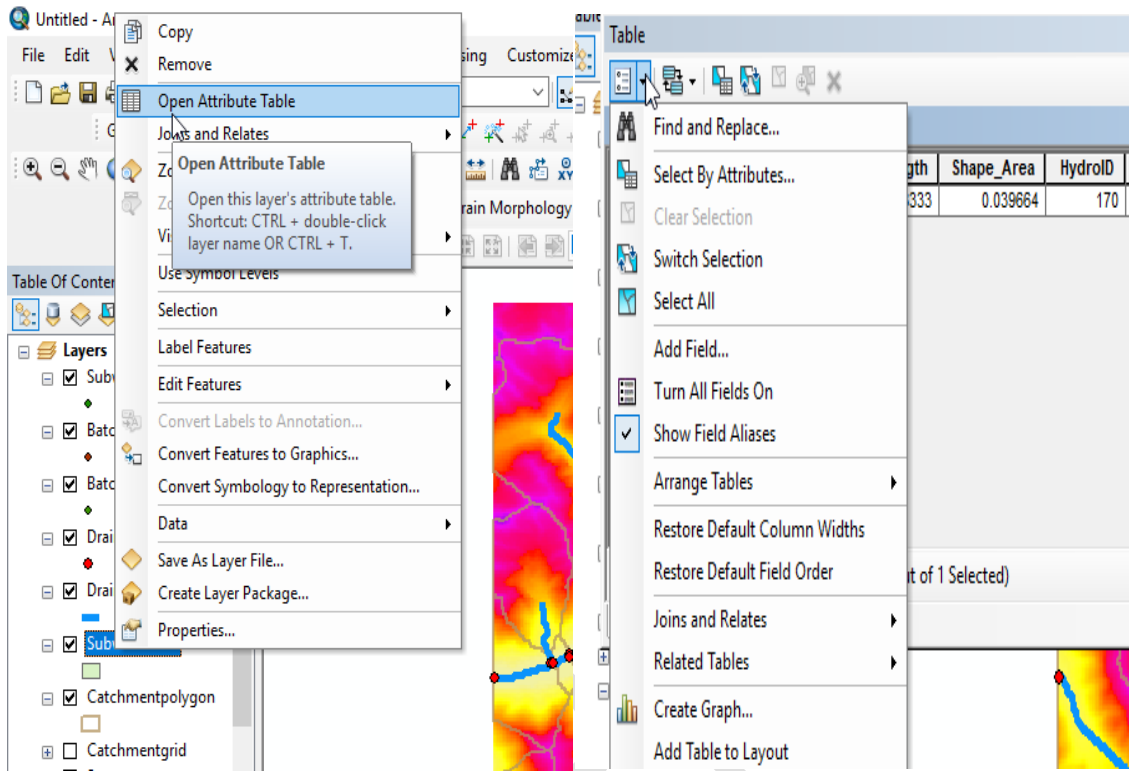
STEP NO:11. Right click on layer and click on “Properties” and select “coordinate system” open the “projected coordinate system”. And Select on “UTM”



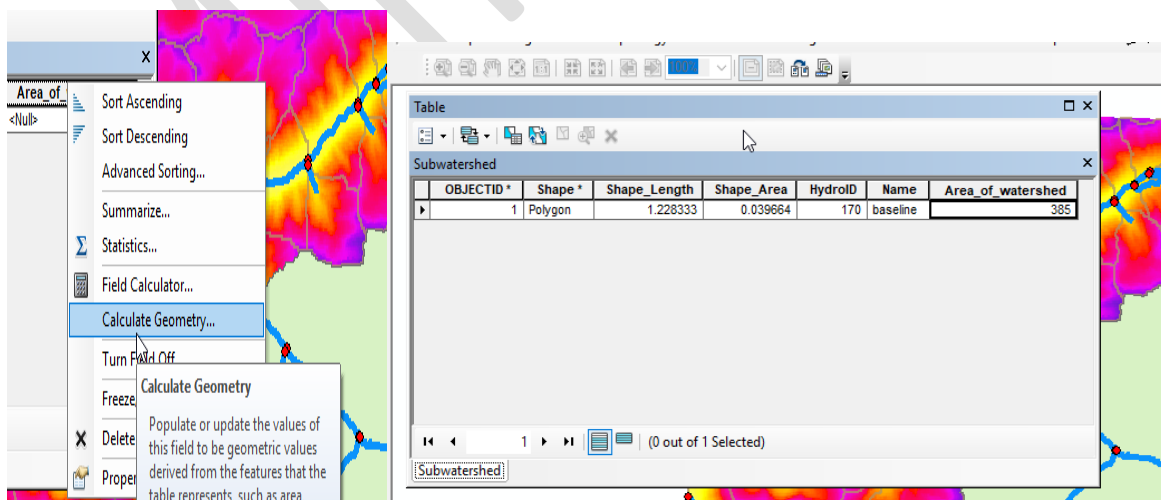
STEP NO:12. Click “WGS 1984” and open “Northern Hemisphere” and select “WGS 1984 UTM Zone 43N”.



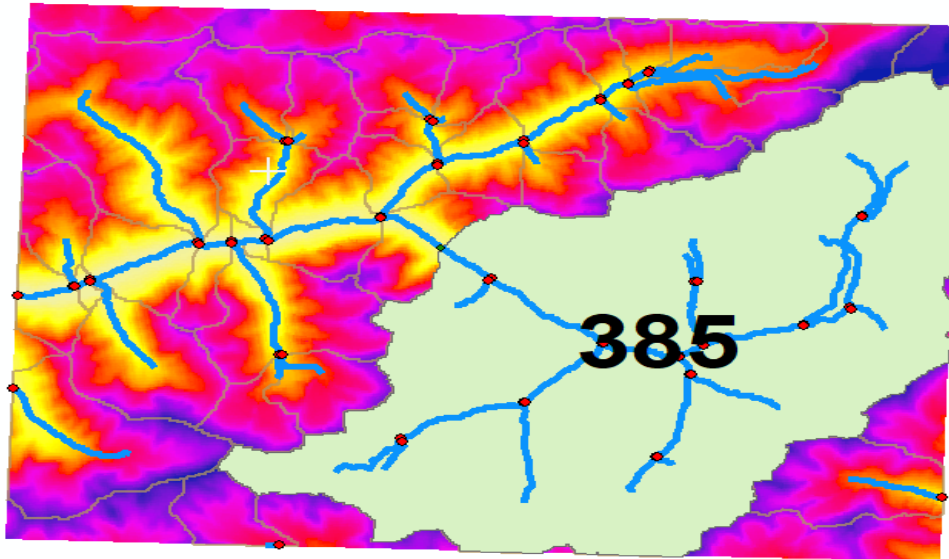
STEP NO:13. Right click on “Sub watershed” and click on “Open Attribute Table”. Then “Add Field”.



STEP NO:14. Now right click on selected field and select “Calculate Geometry” then directly the area is shown.



STEP NO:15. Right click and select properties and label the “Area” and increase the font size of writing and then click on “label feature”.



Conclusions:

- GIS tools can be applied to a digital elevation model (DEM) to divide the region under investigation into hydrologic units whose size depends on such features as the diversity of terrain, density of spatial information, size of the basin, and computer resources
- This method was extensively tested for the Iowa-Cedar River watershed, Iowa, using 100 m grid resolution.
- We get the area of watershed as 385sq. meter

References:

IN THE COMPLETION OF THIS PROJECT I GOT HELP OF ONE OF MY FRIENDS FROM UNIVERSITY OF ENGINEERING AND TECHNOLOGY (UET).