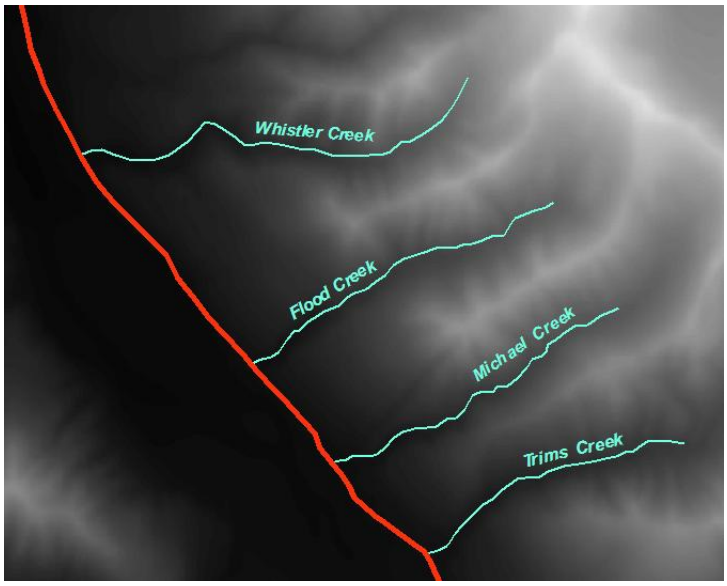
Exercise#5: Delineating Watersheds

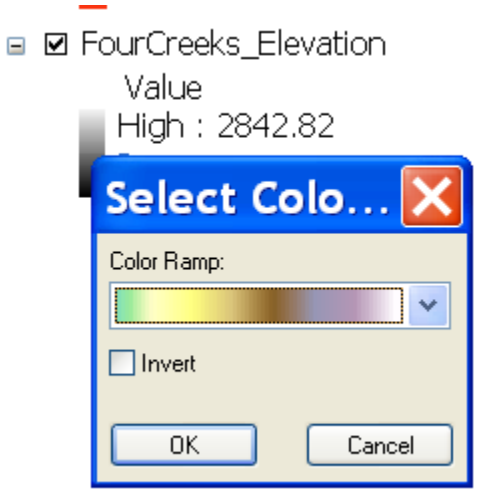
In this exercise, we will use an elevation raster and delineate watershed of four creeks upstream from the Richardson Highway.



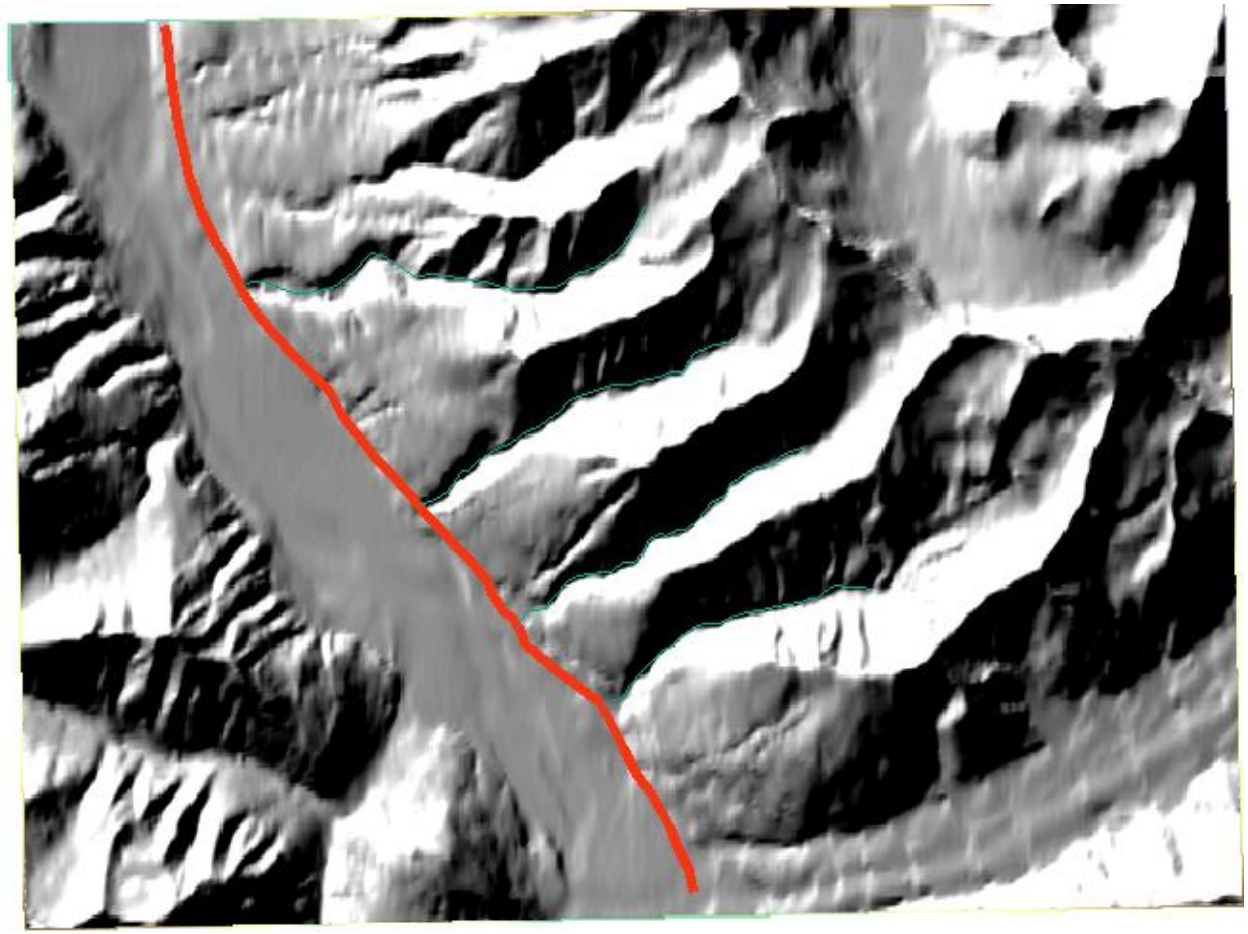
The four creeks all flow to culverts at the Richardson Highway in the Alaska Range.

For each culvert, the likelihood of a flash flood depends in part on the area of the watershed upstream and the steepness of this area.

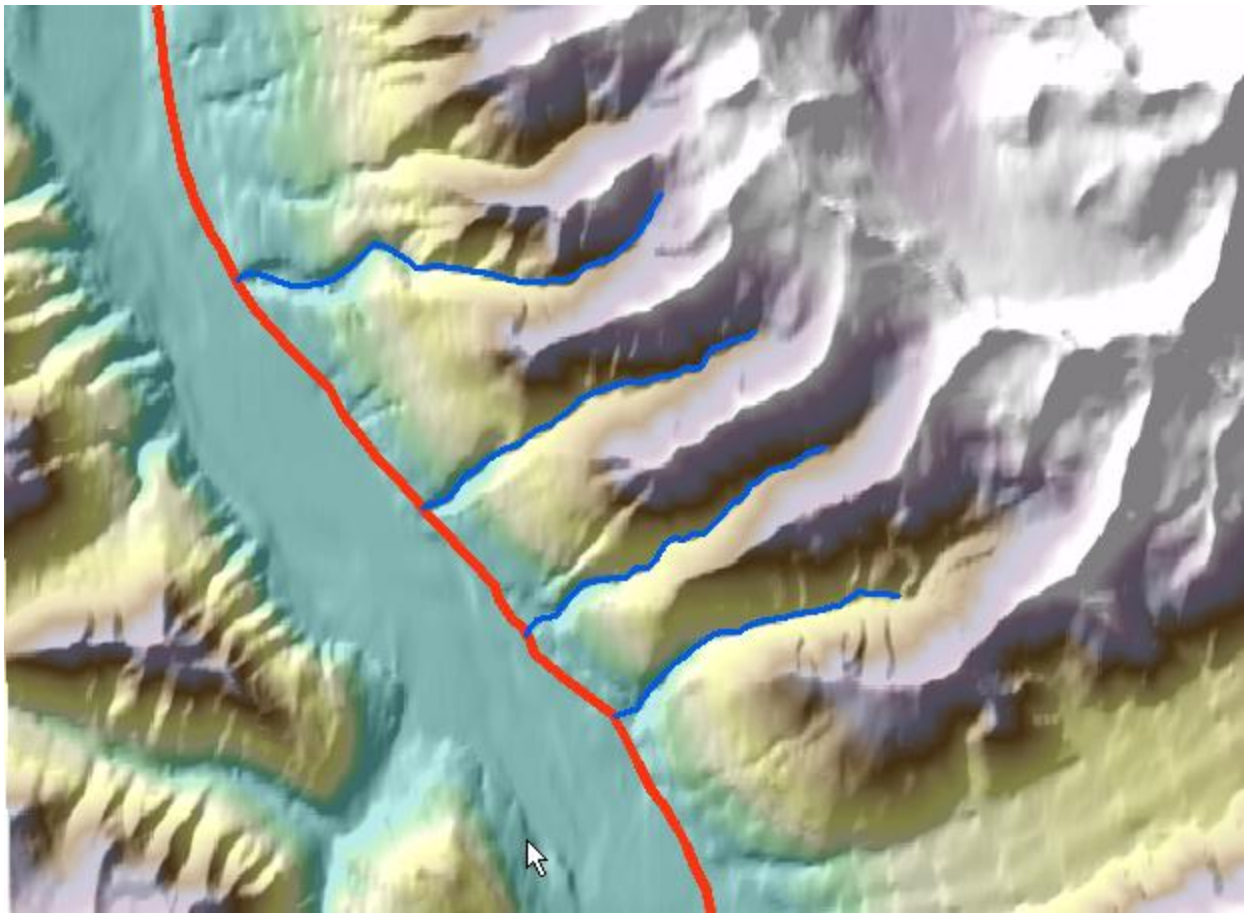
First, change the symbology of your elevation raster



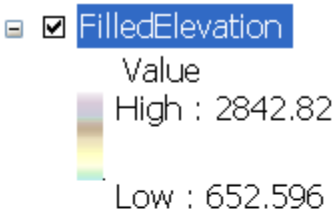
Then use the ***Hillshade*** geoprocessing tool to create a hillshade from your elevation raster.

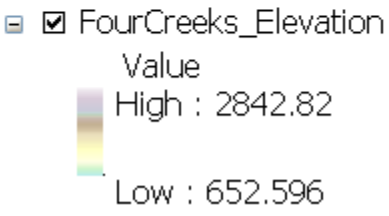


Finally, display your elevation raster with 50 percent transparency on your hillshade raster.



The first step in watershed delineation is to use the ***Fill*** geoprocessing tool to fill in any local sinks or pits in your elevation raster.





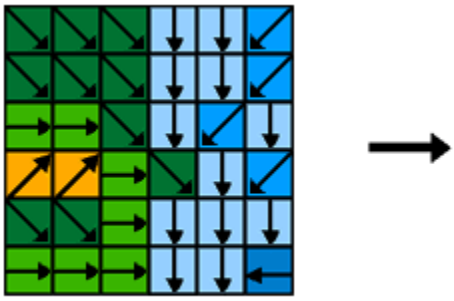
Remove your FourCreeks_Elevation layer as you will now work with the filled elevation layer for the remaining steps.

The first step is to use the ***Flow Direction*** geoprocessing tool to determine the flow direction through each filled elevation pixel. The output raster contains the following flow direction values:

32	64	128
16		1
8	4	2

So for example, a pixel with a value of 1 has surface flow to the east, a pixel with a value of 16 has flow to the west, a pixel with a value of 8 has flow to the southwest.

Next use the ***Flow Accumulation*** geoprocessing tool to determine number of pixels that contribute to the flow into each pixel. For example:

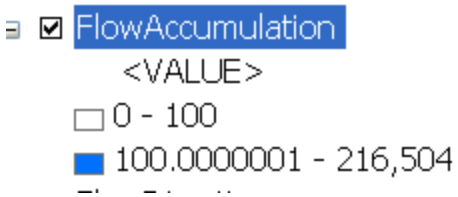


Flow direction

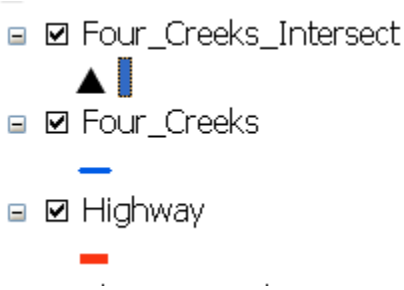
0	0	0	0	0	0
0	1	1	2	2	0
0	3	7	5	4	0
0	0	0	20	0	1
0	0	0	1	24	0
0	2	4	7	35	2

Flow accumulation

Change the symbology so all pixels with at least 100 cells of flow accumulation are colored blue, otherwise no color for pixels with less than 100 cells of flow accumulation.

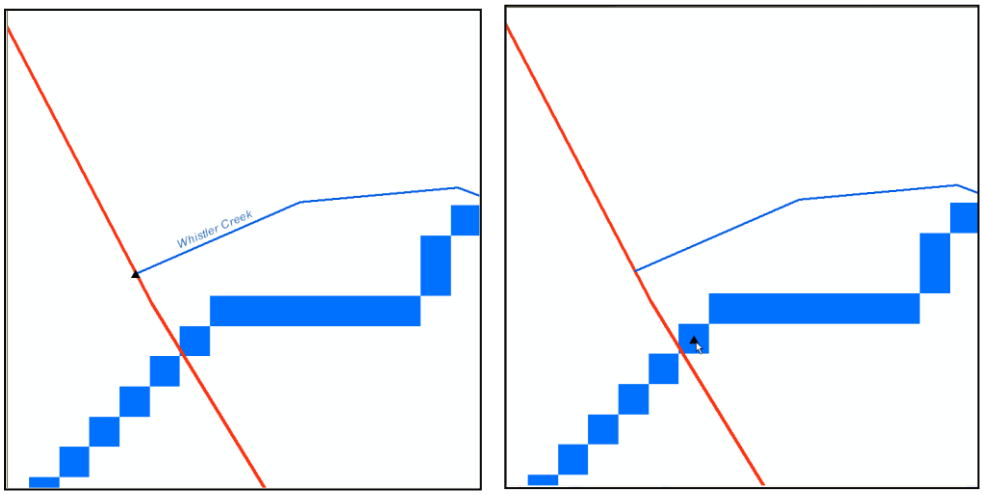


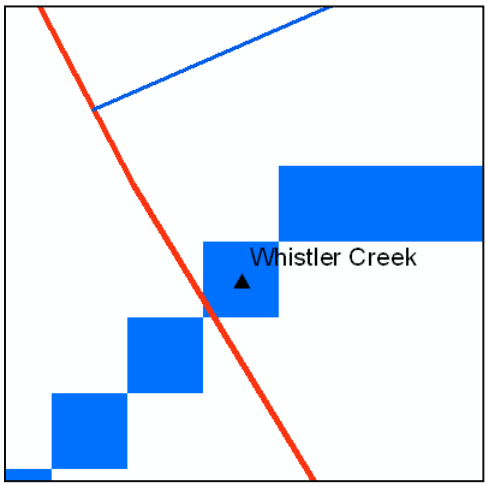
Next, use the ***Intersect*** geoprocessing tool to create points where each of the four creek lines meet the highway line.

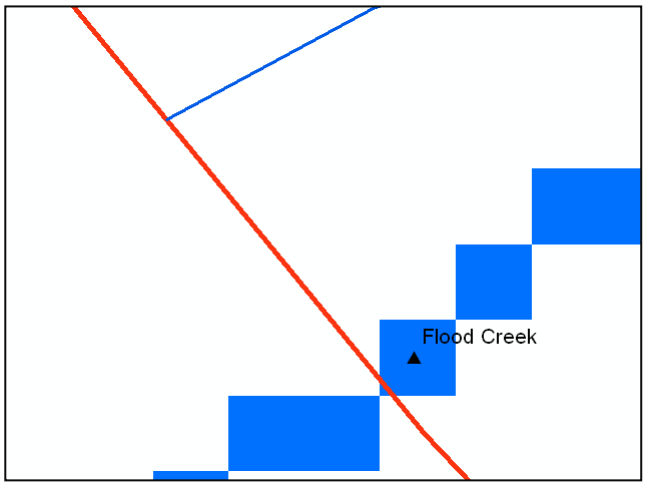


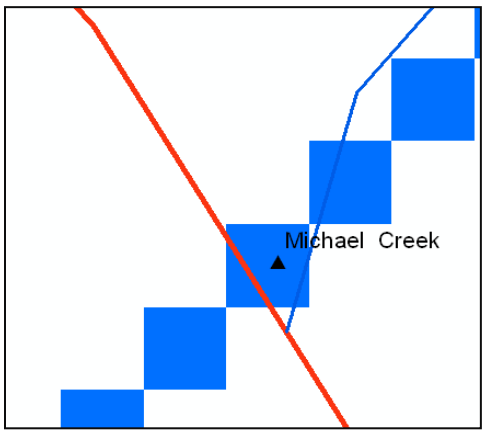
The four points represent each highway culvert. Edit these points and move them so they are centered on a pixel of high flow accumulation.

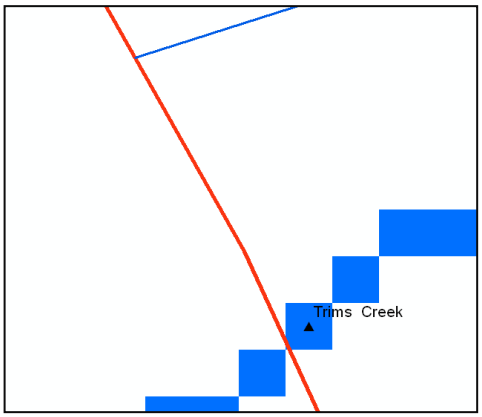
For example:



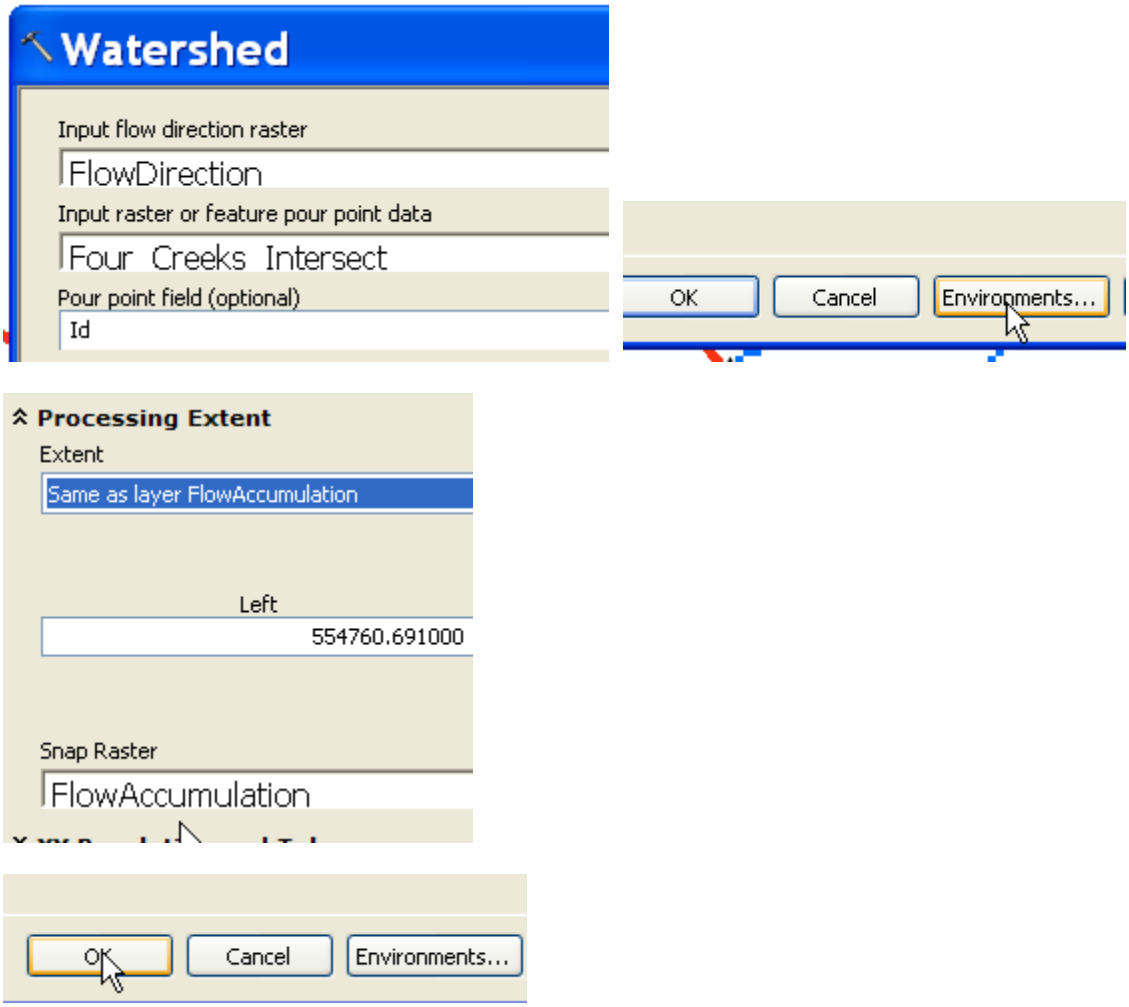


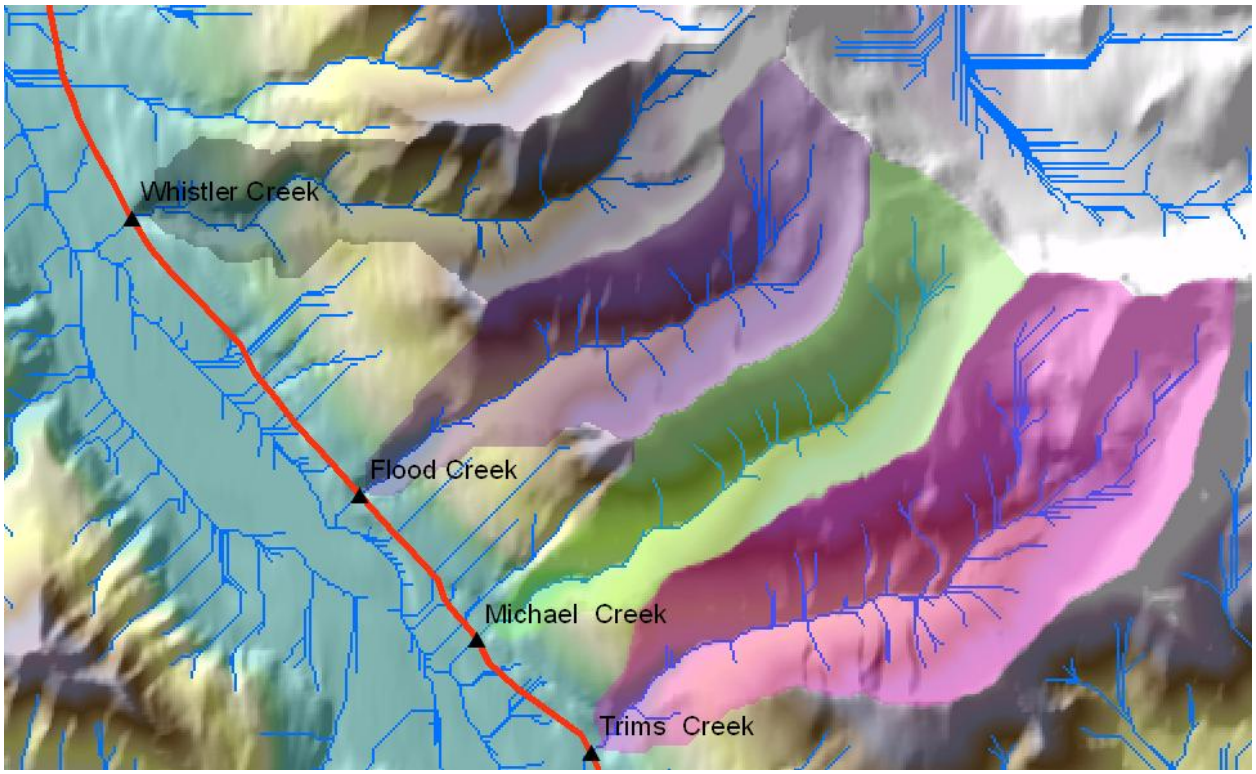






Once you have identified the channel pixel just upstream from the highway, you can run the ***Watershed*** geoprocessing tool to create a watershed raster.





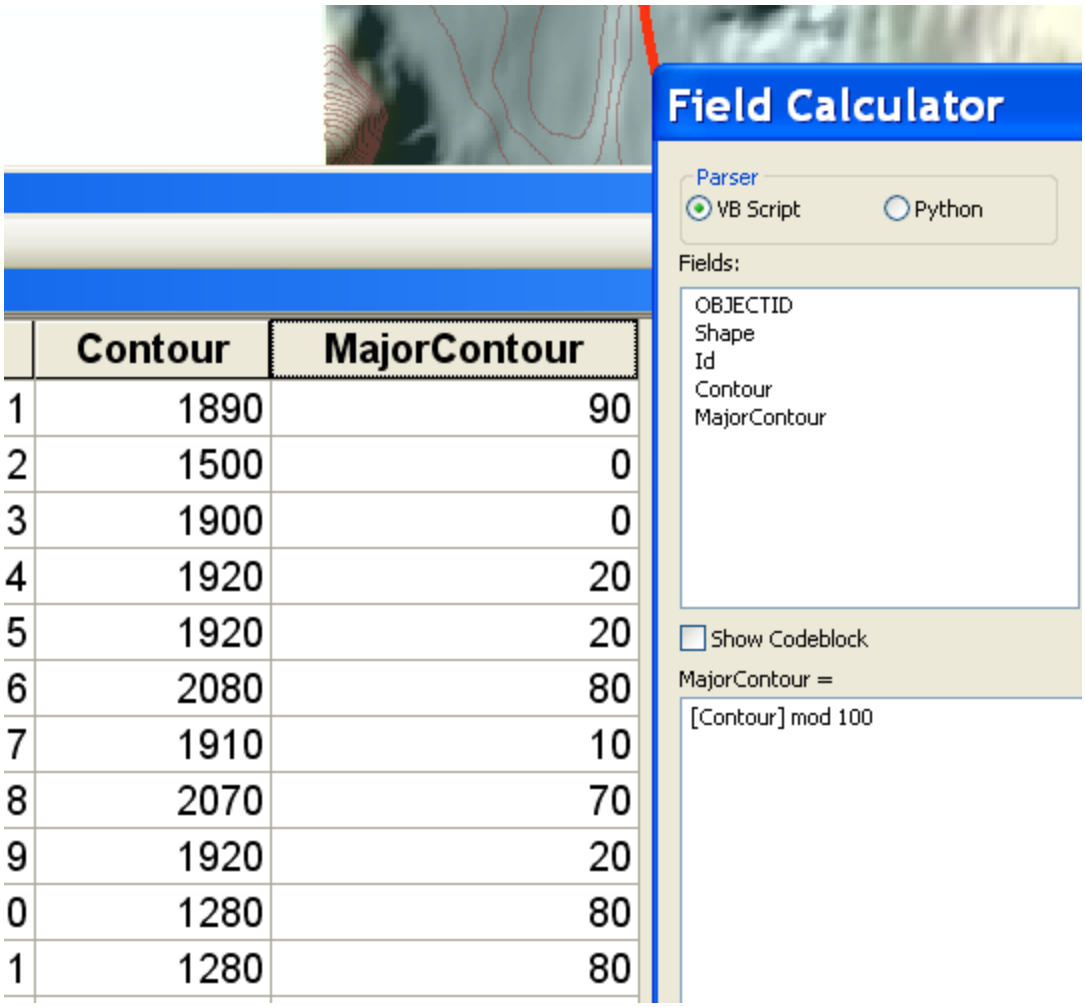
Use the ***Raster to Polygon*** geoprocessing tool to create polygons for each watershed.

And use the ***Contour*** geoprocessing tool to create 10-meter contours from your filled elevation raster.

Add a short integer field named MajorContour.

	Contour	Shape_Length	MajorContour
1	1890	282.027957	<Null>
2	1500	159.295395	<Null>
3	1900	498.248208	<Null>
4	1920	41.944167	<Null>
5	1920	83.401339	<Null>

We want the contours that are increments of 100 meters as Major Contours. You can use the .Mod function to divide each contour value by 100, and place the remainder in your new field.

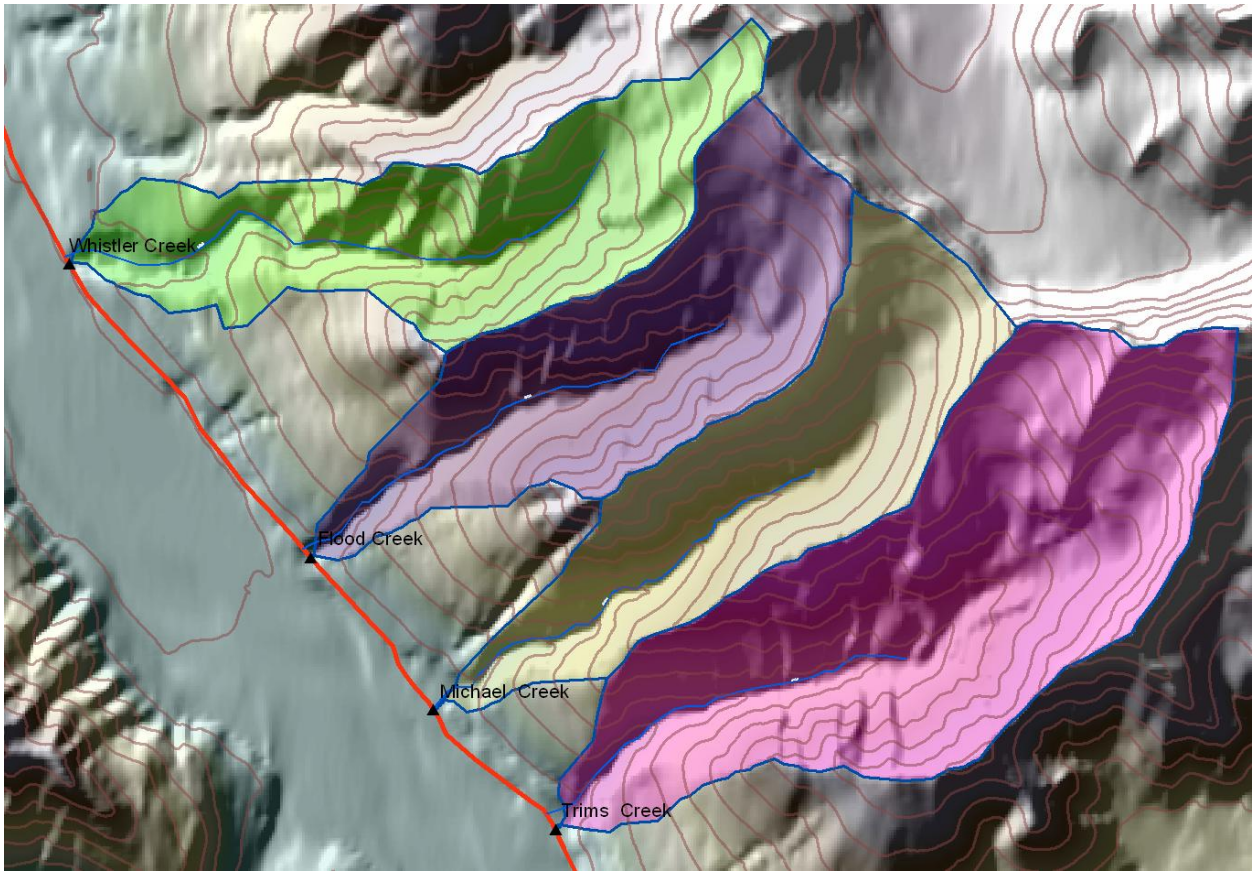


	Contour	MajorContour
1	1890	90
2	1500	0
3	1900	0
4	1920	20
5	1920	20
6	2080	80
7	1910	10
8	2070	70
9	1920	20
0	1280	80
1	1280	80

Select those records with values of 0, and calculate the MajorContour values as 1 (for yes).

Then switch selection and calculate the MajorContour values as 0 (for no).

Use the Layer Definition query property to display only the major contours…


Whistler Creek
Flood Creek
Michael Creek
Trims Creek

Email me a dbf table containing the following information:

Creek	Watershed Hectares	Mean Percent Slope
Trims		
Michael		
Flood		
Whistler		