# Routing Input file preparations

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## Routing Parameter Files

The following files may be required by the model, depending on the flags set in the above input files:

1. Fraction File
2. **Flow Direction File**
3. Flow Velocity File
4. Flow Diffusion File
5. Xmask File
6. Station Location File
7. **UH File**

*Items in **bold** are always required*

The parameter values in the Flow Velocity File, Flow Diffusion File, and UH File can all be calibrated.

The start and stop year and month refer to the period over which the VIC simulation, which is the input to the routing model, was run. The first and last year refer to the period for which the results of the routing are to be written to output.

A detailed documentation on each file is available at https://vic.readthedocs.io/en/vic.4.2.d/Documentation/Routing/RoutingInput/

Structure of the routing file

The format of the input file; and an example are given here:

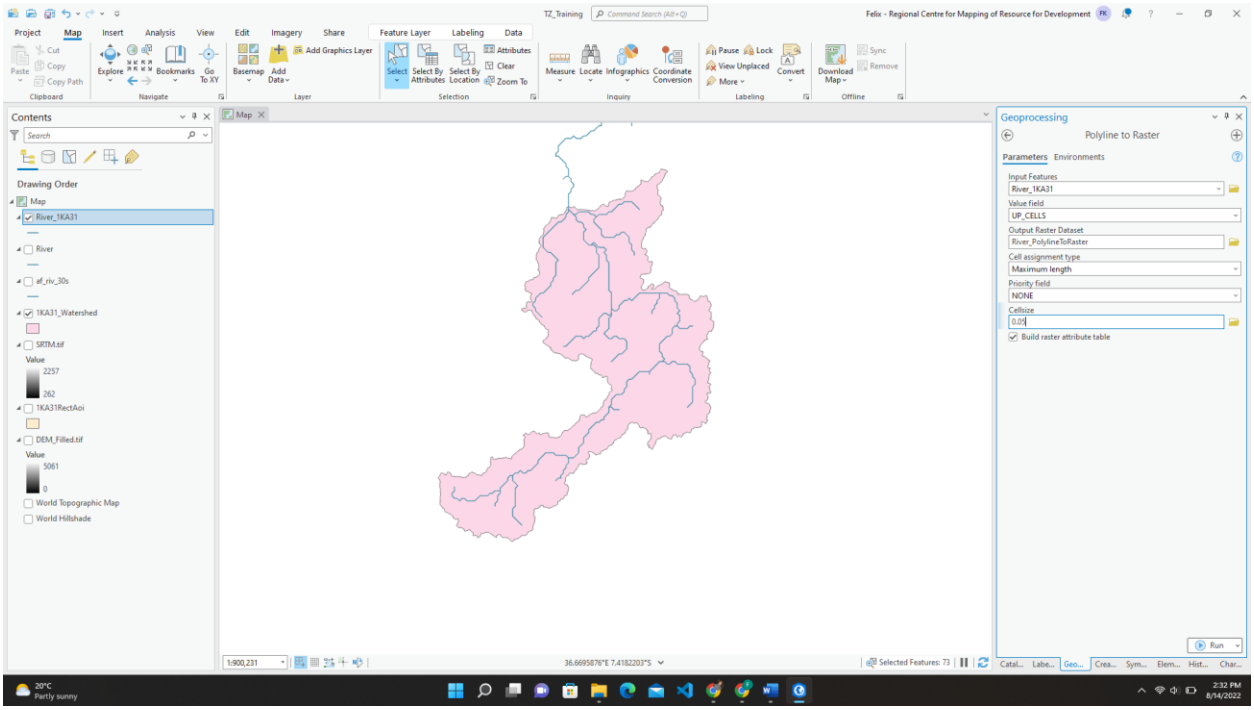
| MAIN TITLE | # INPUT FILE FOR THE COLUMBIA BASIN. |
|---|---|
| TEXT | # NAME OF FLOW DIRECTION FILE |
| `flow direction file` | direc.cmb |
| TEXT | # NAME OF VELOCITY FILE |
| boolean (.TRUE. or .FALSE.) | .false. |
| `flow velocity file` or float | 1.5 |
| TEXT | # NAME OF DIFF FILE |
| boolean (.TRUE. or .FALSE.) | .false. |
| `diffusion file` or float | 800 |
| TEXT | # NAME OF XMASK FILE |
| boolean (.TRUE. or .FALSE.) | .false. |
| `xmask file` or float | 25000 |
| TEXT | # NAME OF FRACTION FILE |
| boolean (.TRUE. or .FALSE.) | .true. |
| `contributing fraction file` or float | ./rout_input/fraction.cmb |
| TEXT | # NAME OF STATION FILE |
| station location file | stations.cmb |
| TEXT | # PATH OF INPUT FILES AND PRECISION |
| location of vic input files and prefix | ./vic/vic_out/fluxes_ |
| No. of decimal places used in VIC input filenames | 3 |
| TEXT | # PATH OF OUTPUT FILES |
| output directory | rout_out/ |
| TEXT | # MONTHS TO PROCESS |
| start and stop year/month of the VIC simulation | 1969 1 1979 12 |
| first and last year/month to write output | 1969 1 1979 12 |
| TEXT | # NAME OF UNIT HYDROGRAPH FILE |

| MAIN TITLE | # INPUT FILE FOR THE COLUMBIA BASIN. |
|---|---|
| unit hydrograph file | uh_all |

For this training, the **flow Direction** and **UH files** will be prepared

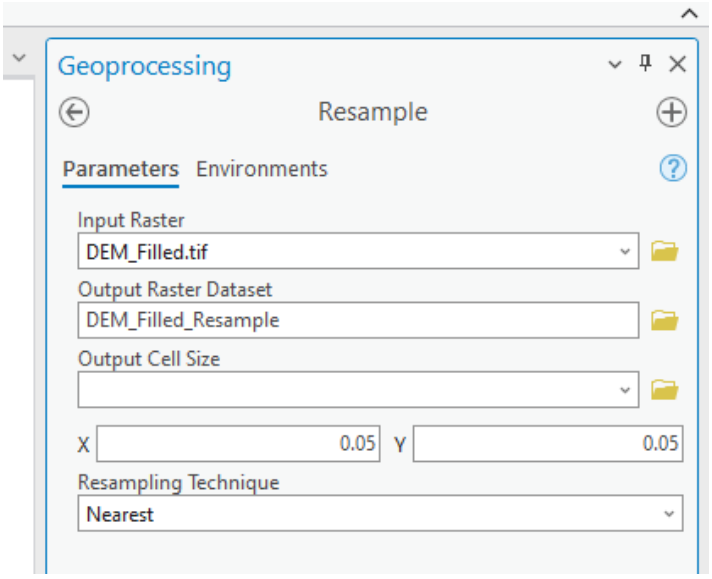
## 1. Flow Direction File

**A DEM** is key input in the preparation of this file. To improve the accuracy of the results, a **River shapefile** is required for to force the flow direction where rivers exist. ArcGIS software is required in this step.

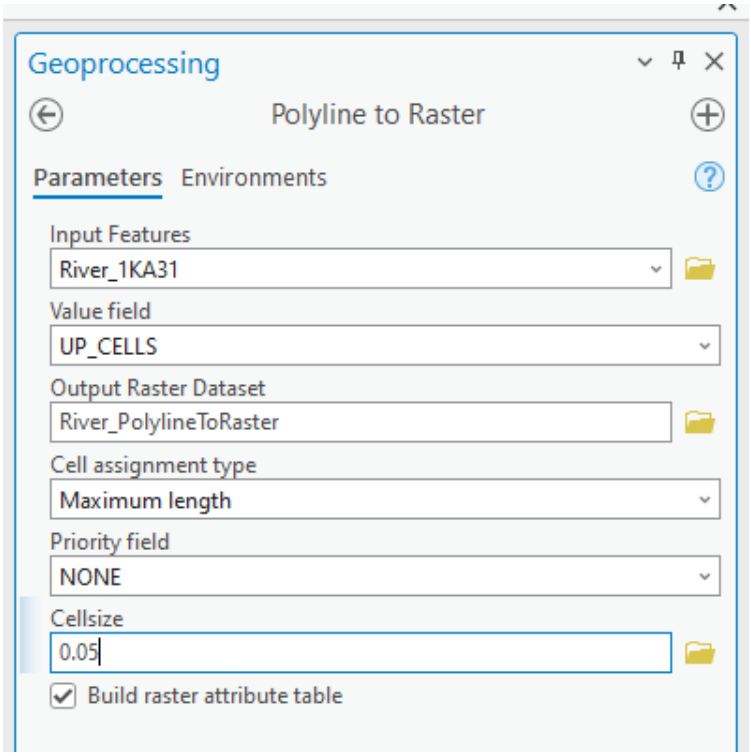



The following steps are followed in the preparation.

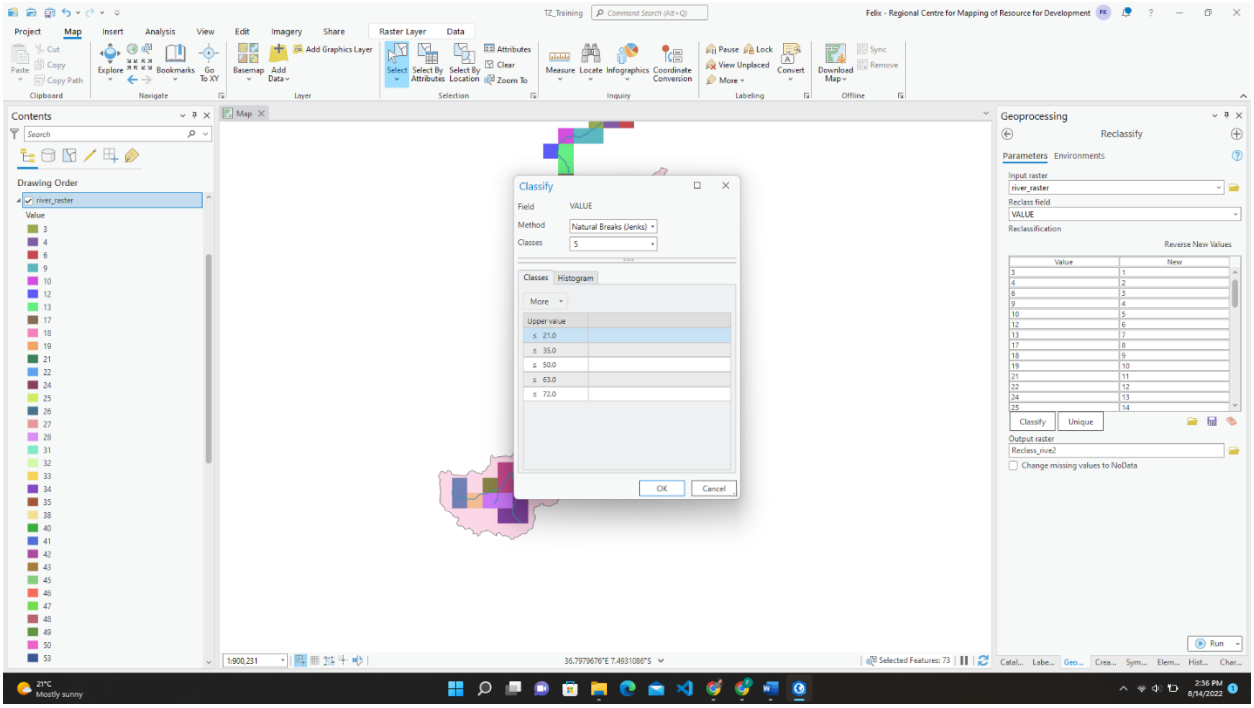
i. **Resampling of DEM from the high spatial resolution to low resolution**

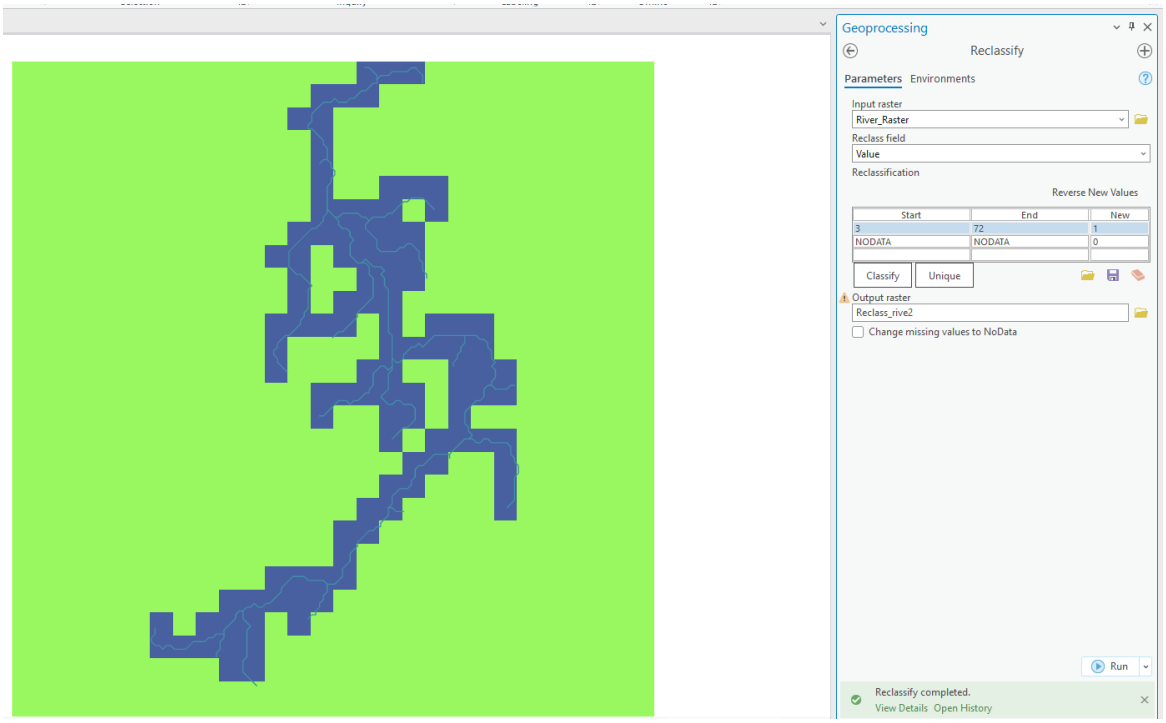



ii. **Convert polyline to raster (River shapefile)**

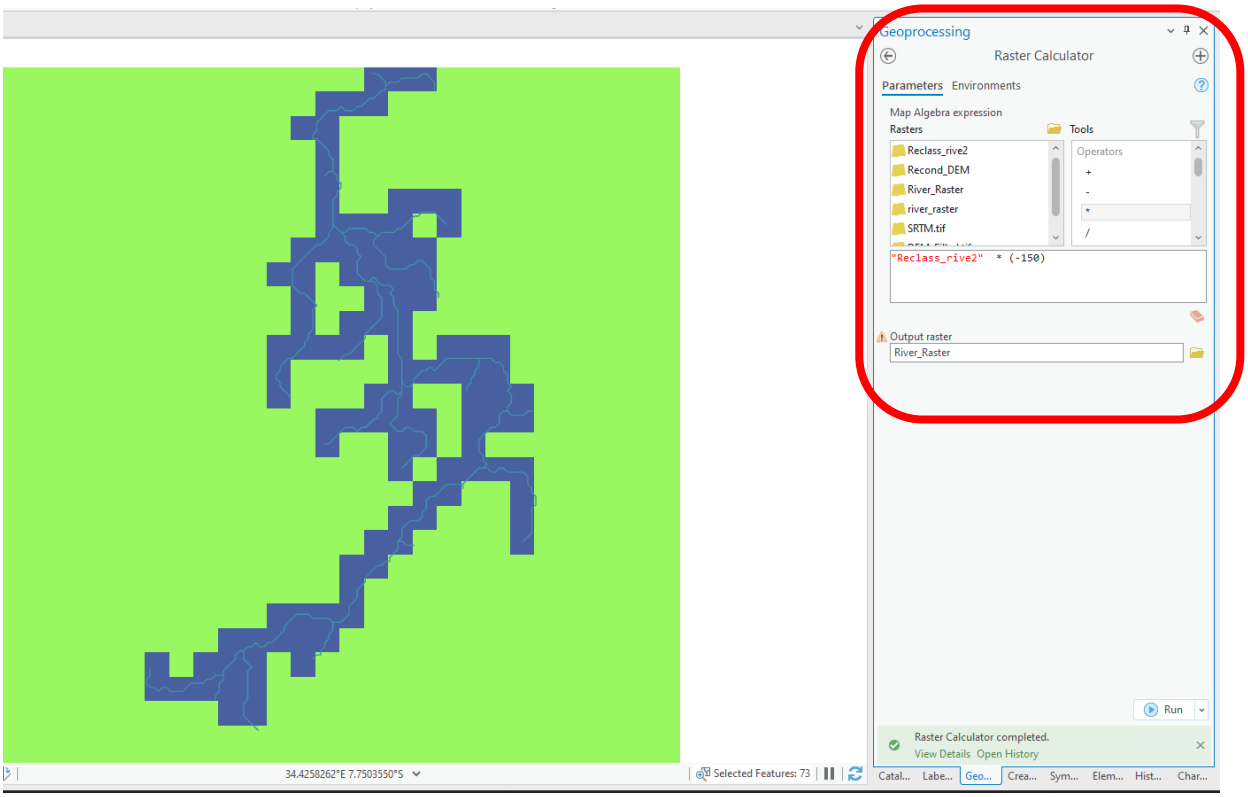



iii. **Reclassify Raster into 1 and 0 where the river is and isn't respectively**

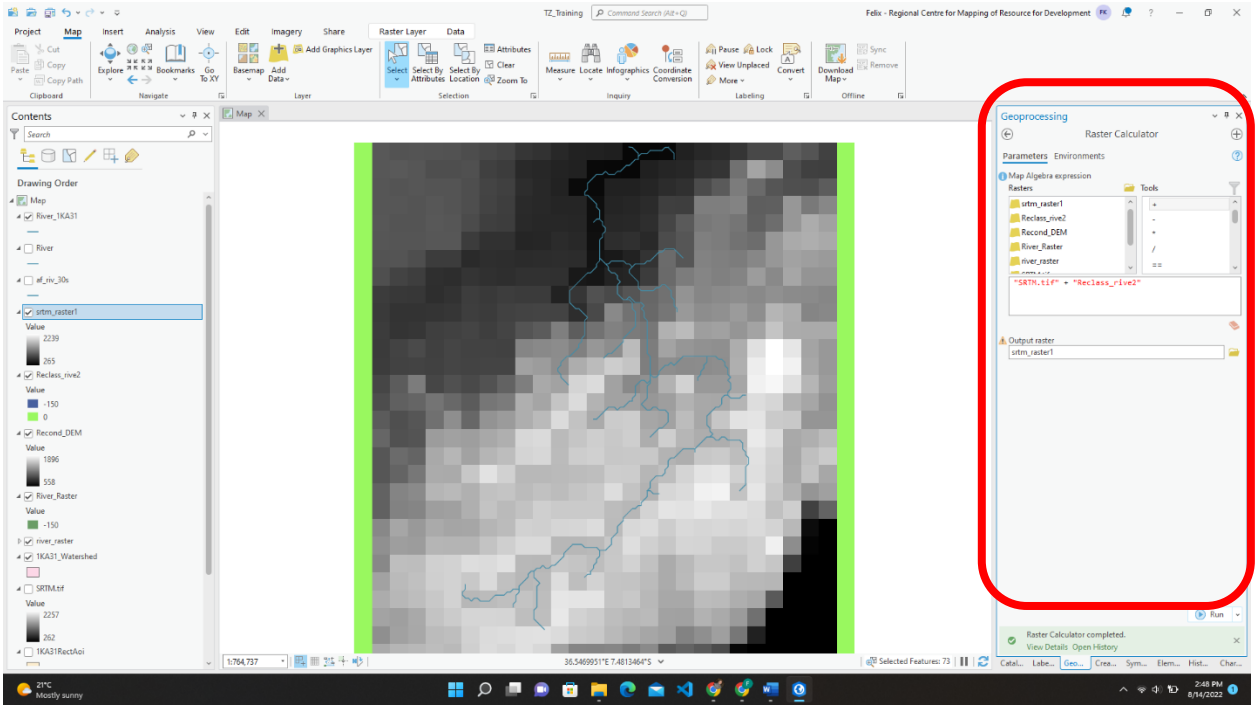


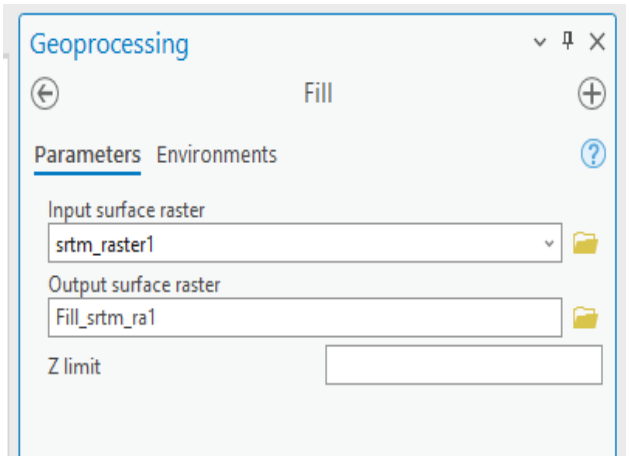

iv. Use raster calculator to assign values where the river is (-150 ) or any negative value in order to drop the elevation of the DEM by 150 meters where there is a river.

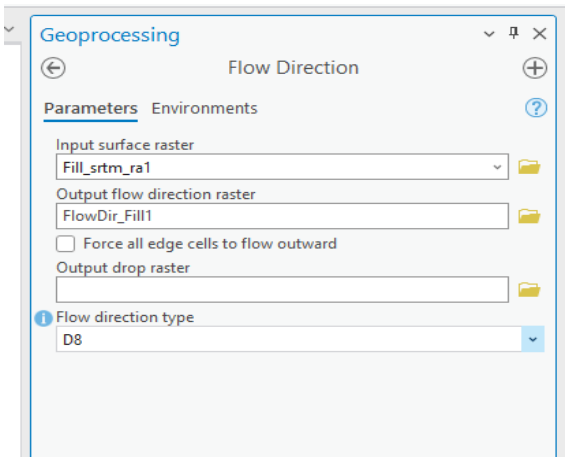


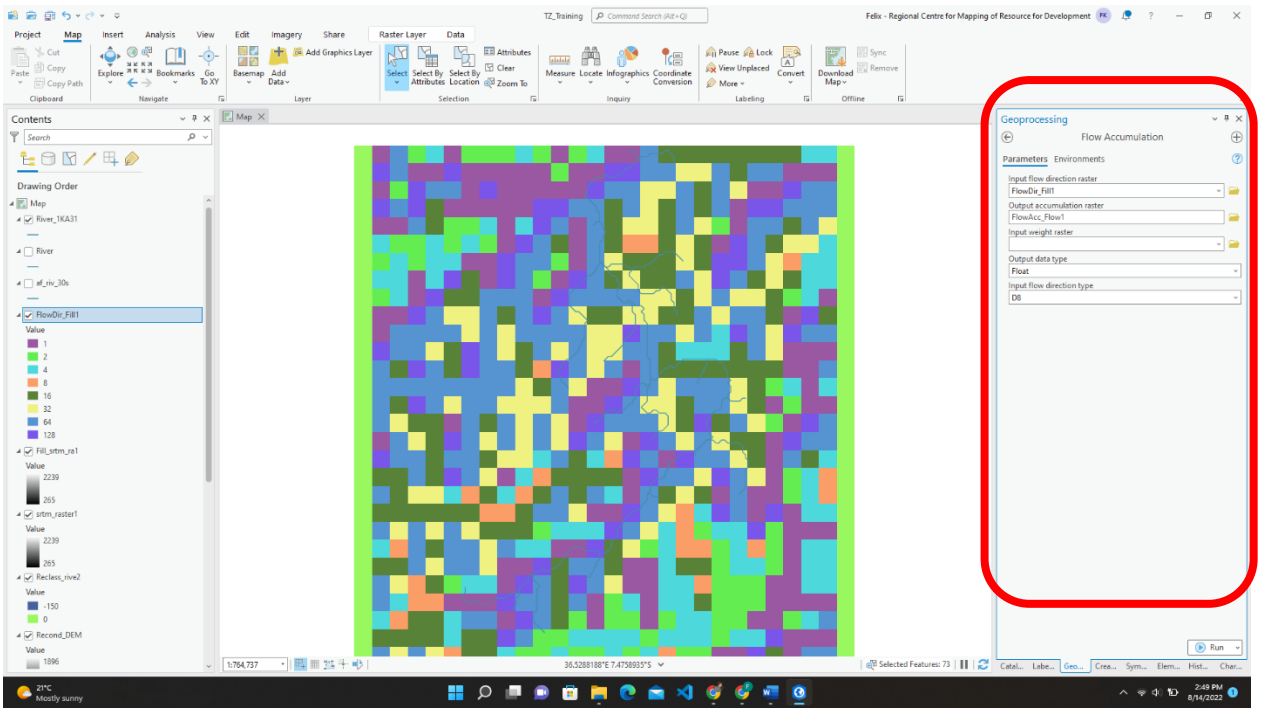

v. **Use raster calculator to merge the DEM and the River Raster file created in i and iv**



vi. **Use the ArcGIS hydrology tool to Fill the DEM, Generate the Flow Direction Raster and Flow Accumulation (just to confirm the how the flow is with respect to a river file)**



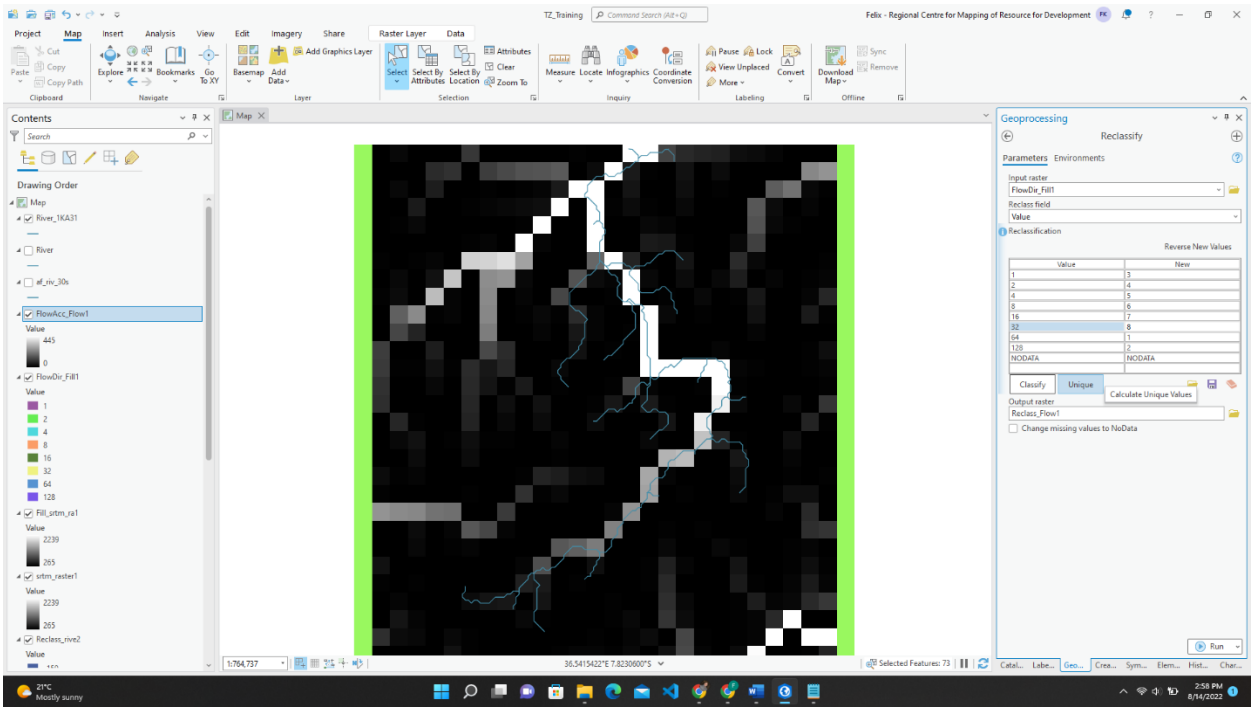




vii. **Reclassify the raster from a D8 FDR raster to a VIC formatted FDR.**

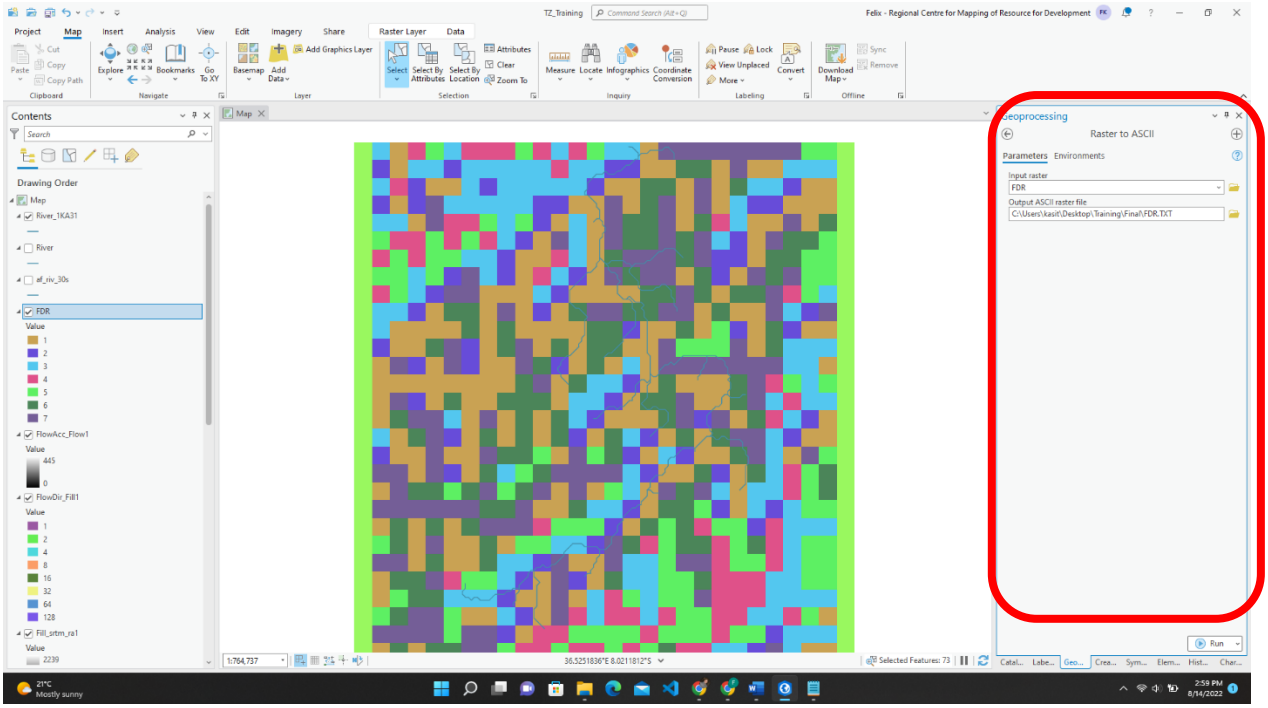
Here are the changes to the FDR to be made.

| | Format required for VIC FDR | ESRI FDR | Resampling (ESRI FDR to VIC FDR) |
|---|---|---|---|
| **1.** | 1= north | 1 =east | 1 =3 |
| **2.** | 2= northeast | 2 =southeast | 2=4 |
| **3.** | 3= east | 4 =south | 4=5 |
| **4.** | 4= southeast | 8= southwest | 8 = 6 |

| | | | |
|---|---|---|---|
| **5.** | 5= south | 16= west | 16=7 |
| **6.** | 6= southwest | 32=northwest | 32=8 |
| **7.** | 7= west | 64=North | 64 = 1 |
| **8.** | 8= northwest | 128=Northeast | 128 = 2 |




**viii. Convert the reclassified raster to ascii/txt file**




## 2. UH

Use the existing default file for UH definition at https://vic.readthedocs.io/en/vic.4.2.d/Documentation/Routing/UH/ as text file.

```
 0   0.0100

1   0.2400
2   0.3300
3   0.1800
4   0.1200
5   0.0500
6   0.0200
7   0.0100
8   0.0100
9   0.0100
10  0.0100
11  0.0100
```

## Routing: Station Location File

The station location file tells the routing model from which grid cells to produce output flow data. Any number of stations may be defined within the basin, as well as a single basin outlet, where the routing network leaves the defined basin. Each line defining a station is followed by another that tells the routing model whether or not a uh_s file has been generated for the current station location. If set to NONE the routing model

generates a new uh_s file in the current directory, otherwise it will read the defined uh_s file. An example station location file is shown below:


The file contains information in the following columns:

1. The first column indicates whether the station is active (1 = active, 0 = inactive),
2. the second column is the basin name which will be used for all of the output files (the first 5 characters are used to form the root of the output files),
3. the third column is the column, from the left, in the gridded direction file where the station is located,
4. the fourth column is the row, from the bottom, in the gridded direction file where the station is located, and
5. the fifth column is the basin area (required, but not used at present).

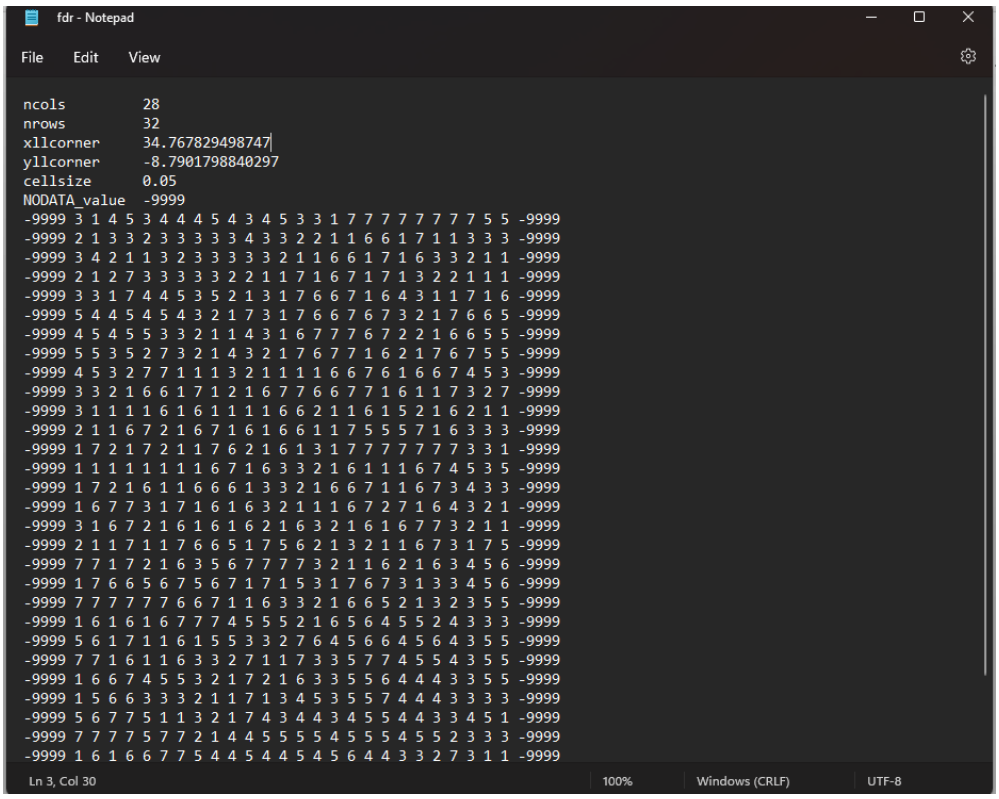
This can be calculated using latitude and longitude while considering the properties of the FDR on margins

**Getting Station location file**

Point data on gauge

| River | ID | Name | Latitude | Longitude |
|---|---|---|---|---|
| Lt. Ruaha | 1KA31 | Mawande | -7.5041 | 35.4586 |

**FDR Asci file**




## Calculation of the station location

Using the station location and the gauge latitude and Longitude.

From the left = (yllcorner- latitude)/ cellsize

From the bottom = (xllcorner – Longitude)/ cellsize

Where:

- ncols is the number of columns in the file,
- nrows is the number of rows in the file,
- xllcorner is the longitude of the lower left corner of the grid,
- yllcorner is the latitude of the lower left corner,
- cellsize is the resolution of the grid, and
- NODATA_value is the value that represents missing or unused grid cells.