Delineation of Watersheds

Nechako Drainage Basin, British Columbia, Canada

*All steps are done in QGIS 3.10.1*

1. Using the SRTM downloader, 30m DEM tiles are obtained for the Nechako river basin and stitched together using the merge tool.
2. The stitched DEM is clipped to the extent of the Nechako basin.
3. The clipped DEM is reprojected to 5x the original grid cell size (0.0002777 🡪 0.0013888) for faster processing using the gdal warp tool.
4. Using the SAGA fill sinks (Wang & Liu) tool with a minimum slope of 0.001, the sinks in the reprojected DEM are filled (only saved the fill DEM).
5. Using the GRASS stream extract tool with a minimum flow accumulation of 10, streams and drainage direction rasters are produced from the sink-filled DEM.
6. For each hydrometric station (imported into QGIS as a shapefile), a buffer of 10’’ is created to locate the stream channels that are near the station, as the station will need to be IN one of the DEM created stream channels to find the drainage basin.
   1. The closest stream cell to a hydrometric station is chosen as the first possible location for the stream gauge
      1. After creating the basin, the basin size/span should be scrutinized to be confident the correct location of the stream gauge has been chosen
7. The drainage direction DEM and lat/long of point within stream cell is inputted into the GRASS water outlet tool, producing a drainage basin raster.
8. Vectorize the drainage basin into a shape file
9. Add a column to the basins attribute table that specifies its area in km2 ($area\*0.000001).

Two QGIS python scripts are available to run the steps of the watershed delineation for multiple stations. Part 1 contains the reprojection, fill sinks, and stream extraction and part 2 contains the creation and vectorization of the drainage basins. These scripts can be found here:

<https://github.com/voremargot/Watershed-Delineation->

Good Video that explains the steps: <https://www.youtube.com/watch?v=Ro-RRzMMw-c&t=1339s>

\*\*Specific Notes about the Nechako watersheds\*\*

**08JA010 [Nechako River below Big Bend Creek]:** This hydrometric station was put in prior to the dam thus the topography of this area has changed significantly since the station was in use. Thus no watershed for this station can be created for this station

**08JA014 [Van Tine Creek near the Mouth]:** The hydrometric station is not in proximity to a DEM-defined stream. Based on shapefiles of the creek from Rio Tinto, the location of the station was set at [-125.4102, 53.2570] (the closest point on main stem of the stream to our coordinates).

**08JA019 [Chedakuz Creek at the Mouth]**

**08JA001 [Nechako River at Fort Fraser]**

**08JA024 [Entiako River near the Mouth]**

Merged small sections from Rio Tinto’s shapefiles onto the shapefile created through the process above.

1. Using the Difference tool, I extracted the areas that were different between the Rio Tinto shapefile and new shapefile
2. Split the Difference shapefile into segments and saved the significant areas
3. Merged the drainage basin with the missing segments
4. All merged segments are demarked with a ‘R’ in the source column of the shapefile.