Stream Ordering of Alipurduar using ArcGIS

This project focuses on stream ordering of Alipurduar using hydrological tools in ArcGIS. By processing DEM data, calculating flow direction and accumulation, and applying stream ordering, I analysed the drainage network to understand water flow patterns in the region.

Objectives: To analyse the stream network of Alipurduar using hydrological tools in ArcGIS.

Workflow:

- Study Area Extraction- Used Extract by Mask to clip the Alipurduar region from the DEM.
- Fill DEM- Applied Fill tool to remove sinks and ensure smooth water flow simulation.
- Flow Direction Calculation- Generated flow direction raster to determine the movement of water.
- Flow Accumulation Calculation- Created a flow accumulation raster to identify major drainage paths.
- Set Threshold Value- Used Raster Calculator to define a threshold and extract significant streams.
- Stream Ordering- Applied Stream Order tool to classify streams based on Strahler's method.
- Convert to Vector (Stream to Feature)- Converted the stream raster into a vector format for better visualization.
- Final Layout & Map Composition

Tools & Techniques Used:

📌 **ArcGIS Hydrology Tools (Spatial Analyst), Raster Calculator, Cartography tools**

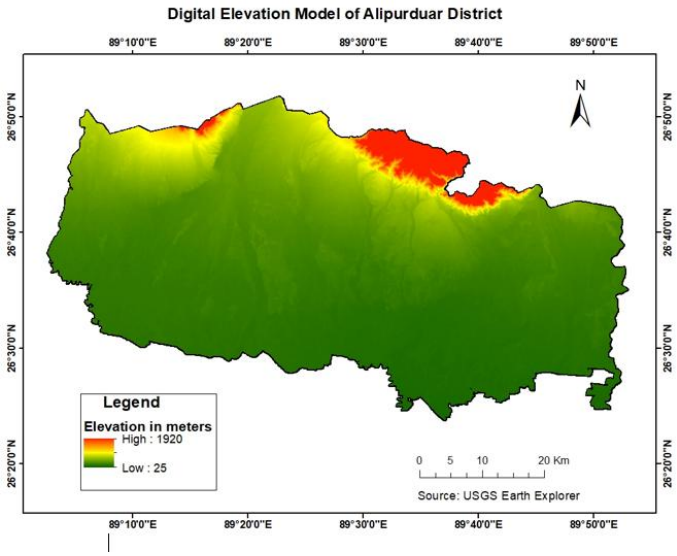
Key Takeaways: This project helped me understand hydrological modeling, spatial data processing, and the importance of terrain analysis in watershed management.

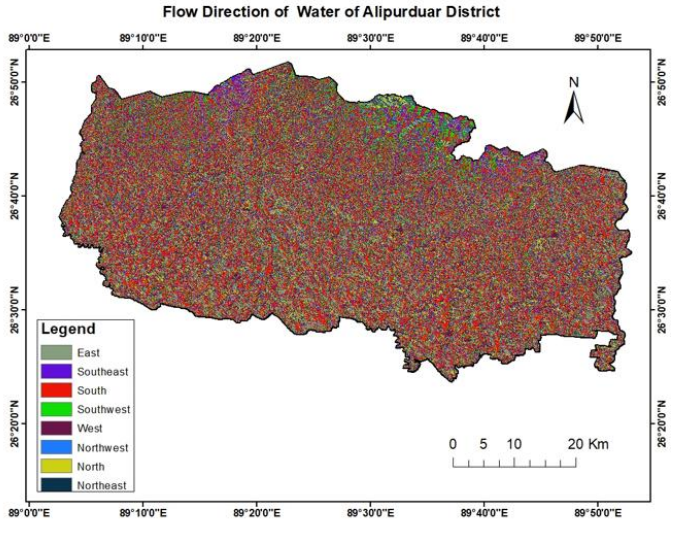
Visual Enhancements:

✅ Arc GIS Python Code for preparing "Stream Ordering of Alipurduar District"

Python

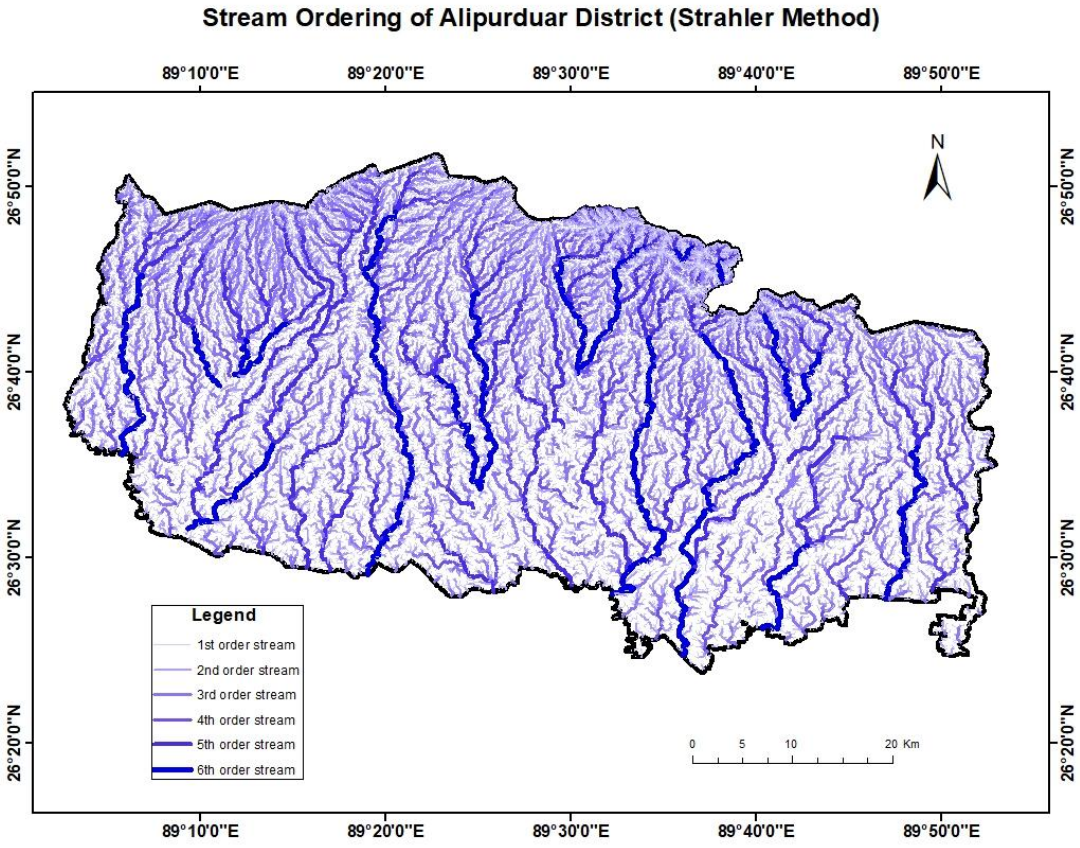
```
>>> import arcpy
>>> from arcpy.sa import*
>>> e_mask=ExtractByMask("Alipur_full.tif","Alipurduar")
>>> fill=Fill("Alipurduar_Dem")
>>> Flow_di=FlowDirection("Fill_Dem","NORMAL")
>>> Flow_Accumulation=FlowAccumulation("Flow_Direction","Fill_Dem","FLOAT")
>>> Stream_Ordering=StreamOrder("Flow_Raster","Flow_Direction","STRAHLER")
>>> Stream_toFeature=StreamToFeature("Stream_Order","Flow_Direction","Stream")
>>>
```





Digital Elevation Model map shows the elevation of Alipurduar District, ranging from 25 m to 1920 m, with higher elevations in the north and lower in the south.

Flow Direction map depicts the water flow directions in Alipurduar District, indicating how surface water moves across the terrain using the eight cardinal directions.



Stream order classifies streams based on their position in a drainage network. First-order streams are the smallest headwater streams with no tributaries. Second-order streams form when two first-order streams merge, and this pattern continues up to higher orders. Higher-order streams (third, fourth,

fifth, and sixth) represent larger tributaries and major rivers. In maps, lighter blue typically represents smaller, first-order streams, while darker or thicker blue lines represent larger, higher-order streams. Stream order helps in understanding water flow, flood management, and watershed dynamics. This classification is crucial for hydrology, environmental management, and ecosystem studies.

In this project, I independently applied methodologies learned at my university to analyze the hydrology of Alipurduar District. Using DEM data and ArcGIS, I visualized the digital elevation model, Flow Direction of Water and stream ordering to understand water flow patterns. This analysis aids in identifying drainage networks and potential water management strategies.