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Remote Sensing

Lab 5

Q1: Using the information page for this dataset, what information does the Entity ID of this tile contain?

Entity ID: SRTM1N38W106V3

SRTM 1 | **SRTM**

1 | **1 arc-second**

N38 | **Latitude**

W106 | **Longitude**

V3 | **1 Arc-second Global data set**

Acquisition Date: 2000-02-11 00:00:00-06

Publication Date: 2014-09-23 00:00:00-05

Q2: What do the units of this DEM represent?

Meters of elevation above the Datum

Q3: The DEM is already in meters that represent elevation, so why is this step necessary? What are we actually defining here, and why is it important to set a vertical coordinate system when working with elevation data?

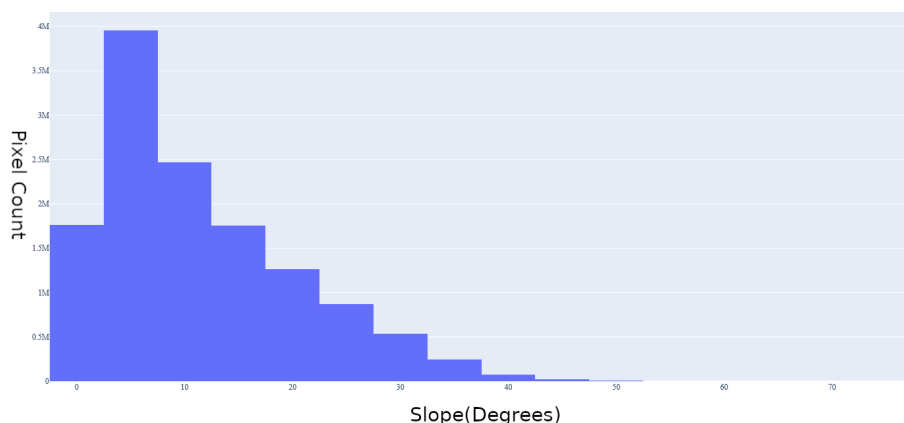
(Hint: Elevation is always measured relative to something — what is that reference surface?)

The WGS84 projection can have multiple datums associated with it. Each datum is a slightly different model of sea level across the globe, which is where we measure sea level from. So, if we have the wrong datum for our DEM, the absolute elevation values will be incorrect.

Q4: What do the values in this raster represent? Briefly describe what the histogram says about your landscape. Is this what you expected? Why or why not?

The values in this raster represent degrees from level, where 0 is level, and 90 is normal/perpendicular to the surface.

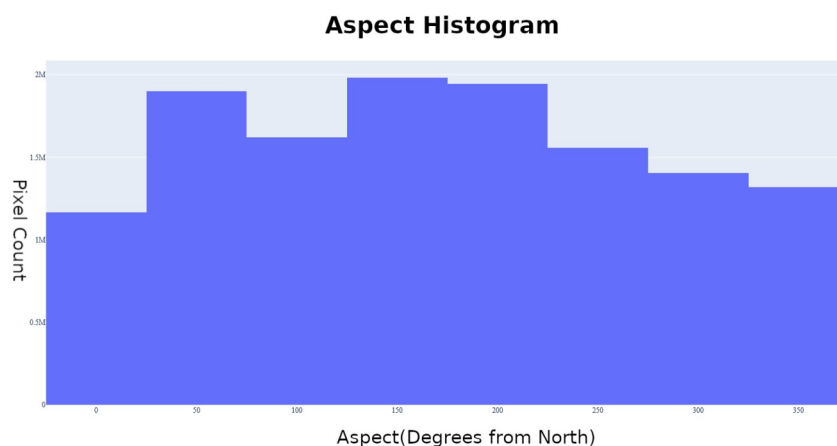
Slope Histogram



The histogram shows that the majority of the DEM has a slope below 15-20 degrees, where the peak values lie between 5-10 degrees. A sliver of values are over 45 degrees. The chart is also right skewed. The slope is slightly lower than I expected, as this is a mountainous area, however the valleys between the mountains are still rather flat, and cover a large area. This was the only thing that was unexpected to me.

Q5: Click on a cell of your Aspect map. What do the values mean? Which value or range of values is South-east?

The values are the compass heading of the slope, so if I am standing on a location which value is 0, if I were to look downhill, I would be looking North. South-east would be between 90 and 180.



Q6:
What is curvature?

Curvature is the rate of change of the slope, similar to what would be the second derivative of elevation (slope being the 1st as the rate of change of elevation.)

What is planform curvature and how does it differ from profile curvature?

Planform curvature is the change in slope as you stay on the same elevation contour. So if you are walking up a relatively flat mountain ridge line, with steep slopes on either side, the slope changes from steep, to gradual and you would get a negative value for planform curvature. Profile, on the other hand is the change in slope following the direction of the slope. (I should note that the docs I have read on this are from the same tools I used in QGIS to process, and there is a distinction made between plan and tangential curvature

which ESRI does not make, plan is along a contour while tangent is perpendicular to profile. [which makes them very simliar, but slightly different.]

How does mean curvature differ from the other two?

Mean curvature is an average between the two and gives a more general sense of curvature where direction is less relevant.

If we care primarily about water flow over the landscape, which curvature type is most relevant? Why?

Between plan and profile, arguments could be made for either. Plan gives a distinct value of where water will flow away from and into, while profile can help us understand where a streams flow rate may be increasing or decreasing.

Q7:

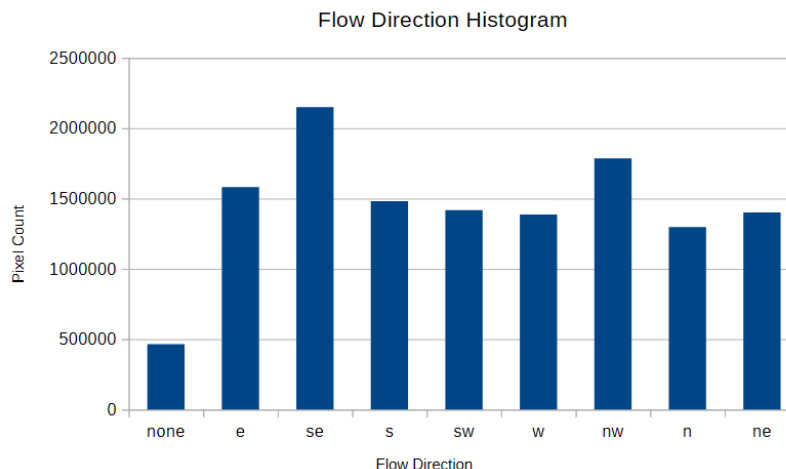
What do Azimuth and Altitude represent?

If we imagine our DEM as a bumpy surface on a table, where we are looking directly down upon, we can illuminate this surface with a light from different directions. Azimuth is rotating the light around the center of the map on the parallel plane, while Altitude rotates the light on the perpendicular plane.

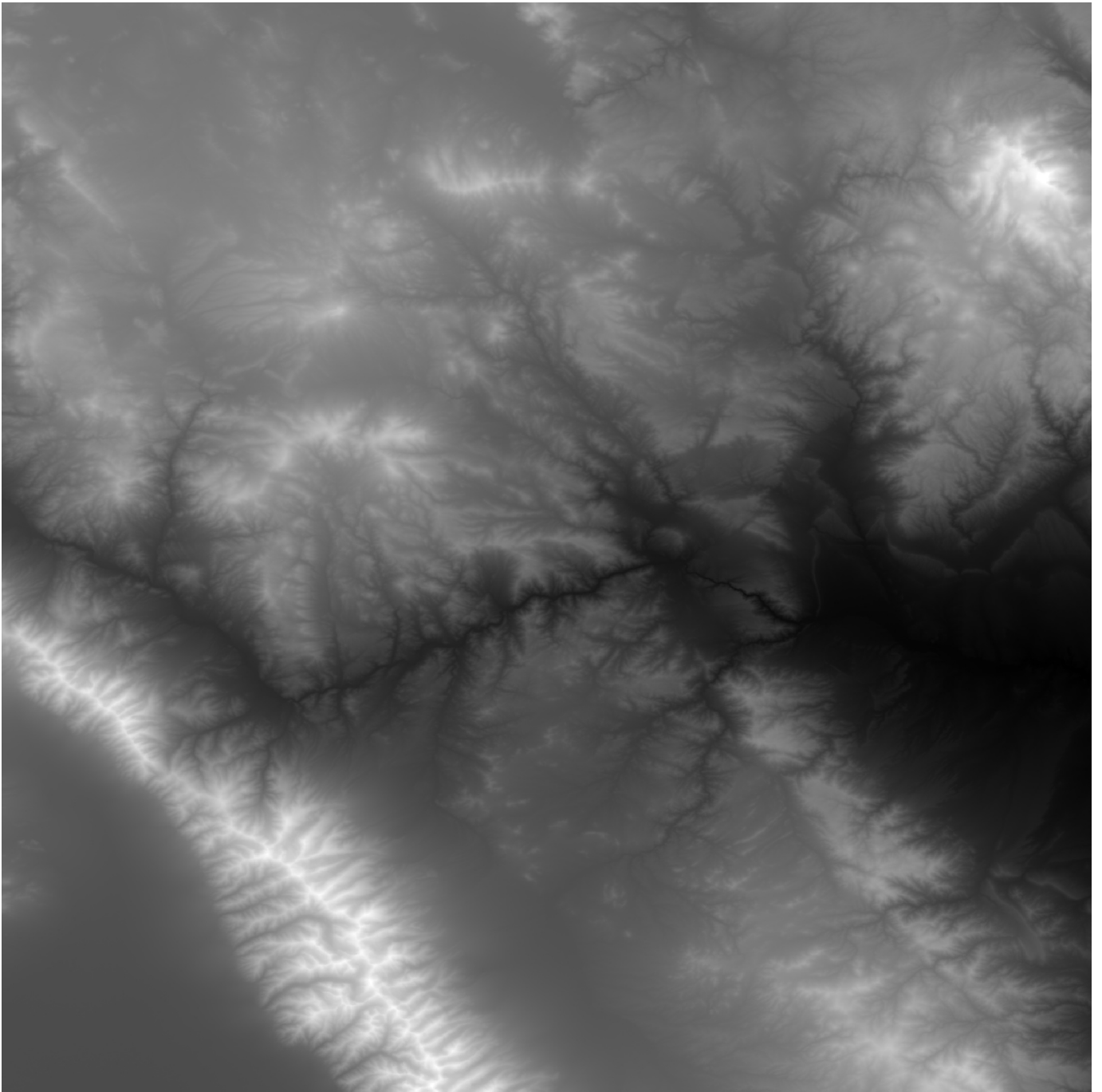
Why might we want to change these settings?

Changing these settings may reveal different information from different angles, such an interesting slope that may have been parallel to the direction of light. However, there really are very few places you should change these values to, as rotating the azimuth 180 degrees from convention (usually convention is having the light come from the north west) would cause the image to appear inverted to what it actually is.

Q8: Briefly describe the histogram. Do the visible trends match your expectations about water flow across your landscape? Why or why not?



DEM

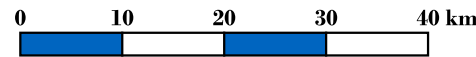


Slope Map, Greater Canyon City Region, CO

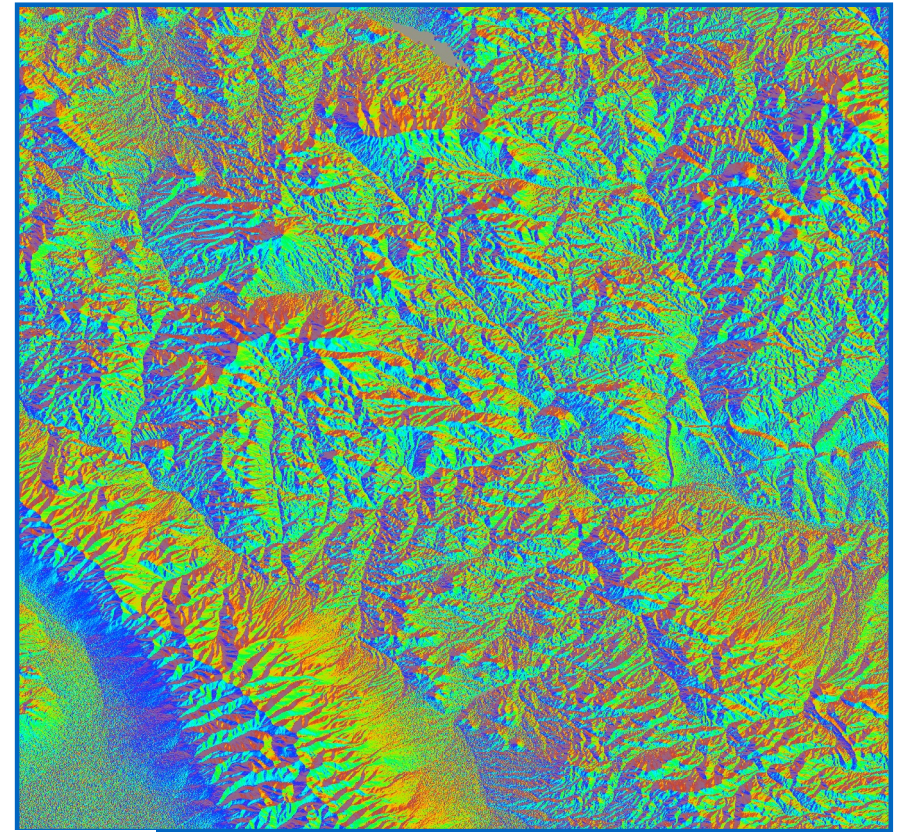


Map 1

A map depicting the slope across the landscape of the Greater Canyon City, CO Region. The more orange a pixel is, the steeper the slope is. A hillshade map is overlaid to give a better understanding of the topography. Slope is generally steep in the northeast, where we approach Pikes Peak, and also in the southwest where the San Juan range lies.



Aspect Map, Greater Canyon City Region, CO



Map 2

A map depicting the aspect of the slope across the landscape of the Greater Canyon City, CO Region. The hue changes as the direction of the aspect changes, north being red, east being yellow-green, south being cyan, west being purple.

Slope Histogram

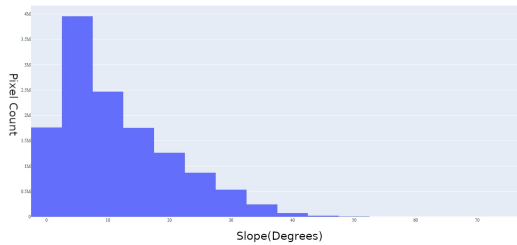


Figure 1

A histogram of the slope of Map 1. Here we see that the majority of the area has a slope that lies below 15-20 degrees. The greatest slope count lies in the 5-10 degree bucket at almost 4 million pixels, double the 0-5 degree bucket. There is a right skew of the graph which tapers off to less than 100k pixels that is above 45 degrees.

Aspect Histogram

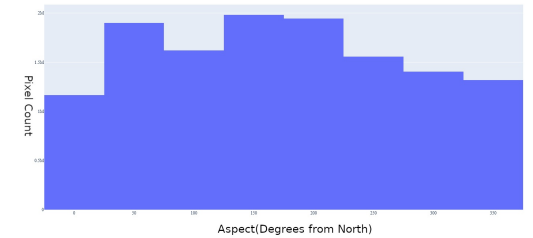
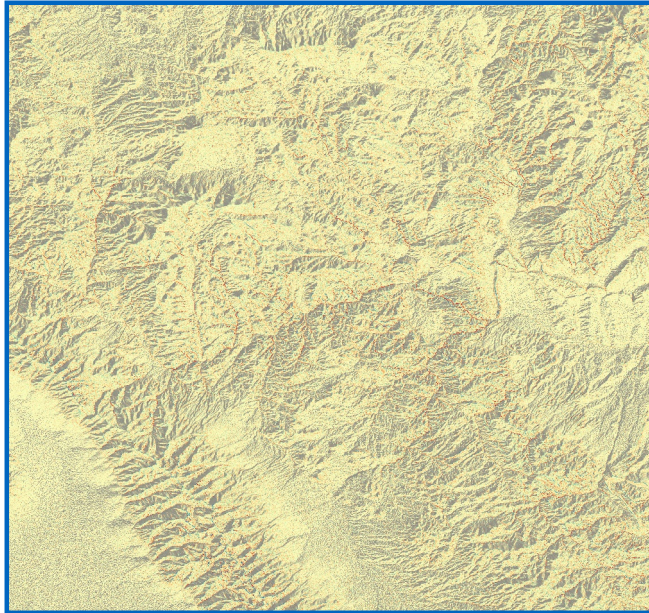
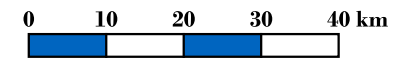


Figure 2

A histogram of the aspect of Map 2. We see a near random distribution of aspect, though there is a small rise in the count of pixels in the south.



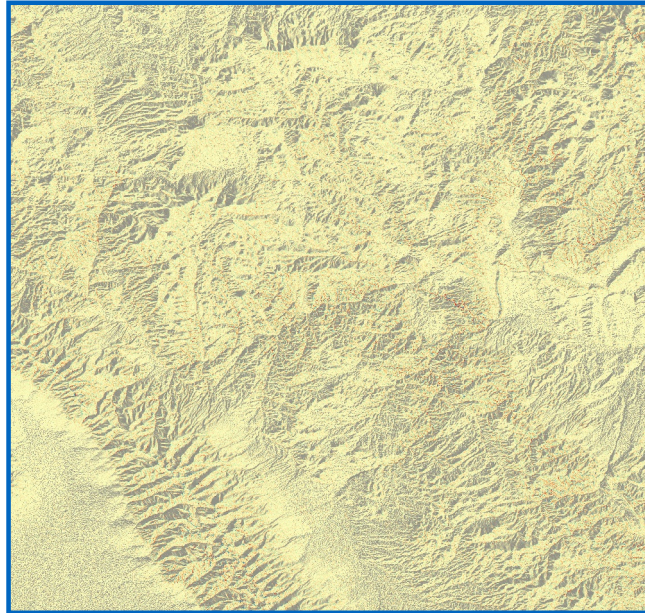
Curvature



Profile Curvature

Map 3

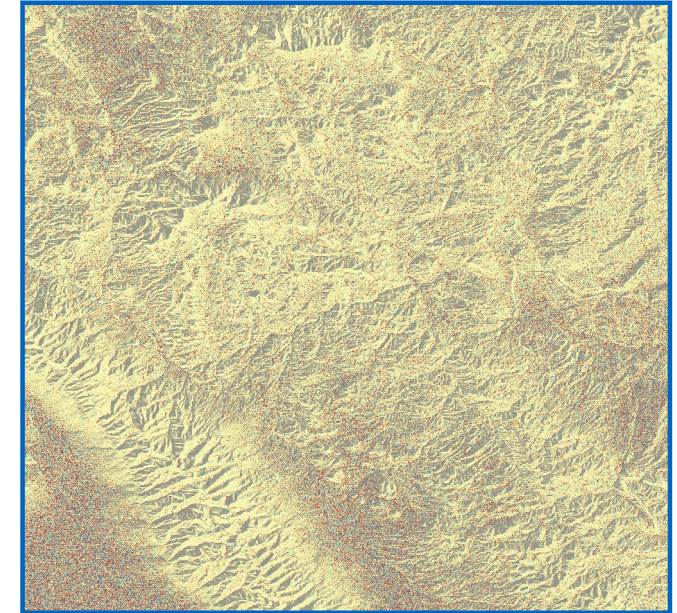
A map depicting the profile curvature across the landscape of the Greater Canyon City, CO Region. A hillshade layer is also present to give better context of the terrain. Red is a negative curvature and blue is a positive curvature. Profile curvature is the change in slope along the direction of the flow at each location.



Mean Curvature

Map 4

A map depicting the mean curvature across the landscape of the Greater Canyon City, CO Region. A hillshade layer is also present to give better context of the terrain. Red is a negative curvature and blue is a positive curvature. Mean curvature is the average between plan and profile curvature.



Planform Curvature

Map 5

A map depicting the planform curvature across the landscape of the Greater Canyon City, CO Region. A hillshade layer is also present to give better context of the terrain. Red is a negative curvature and blue is a positive curvature. Planform curvature is the change in slope perpendicular to the direction of flow.

Hillshade

Map 6

A map depicting the the landscape of the Greater Canyon City, CO Region if it were illuminated from the Northwest. A hillshade map simply provide where shadows and highlights would lie when the topography is lit from a certain angle.

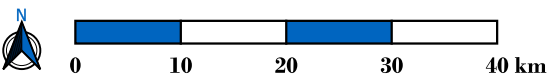
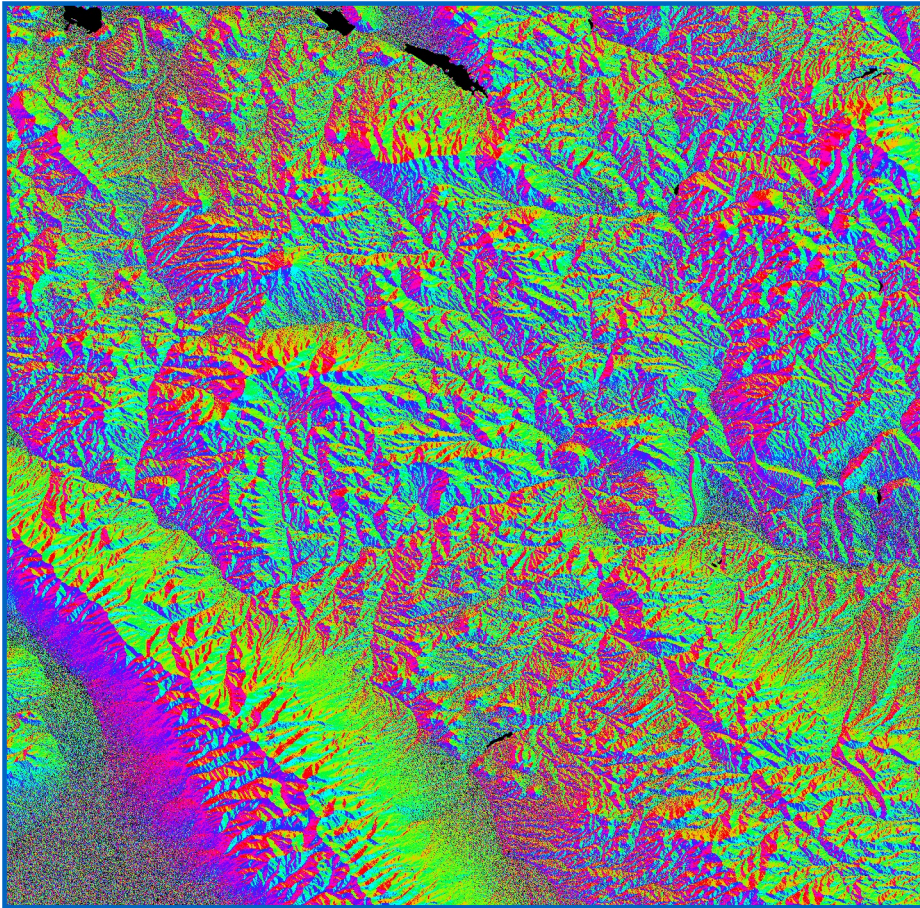
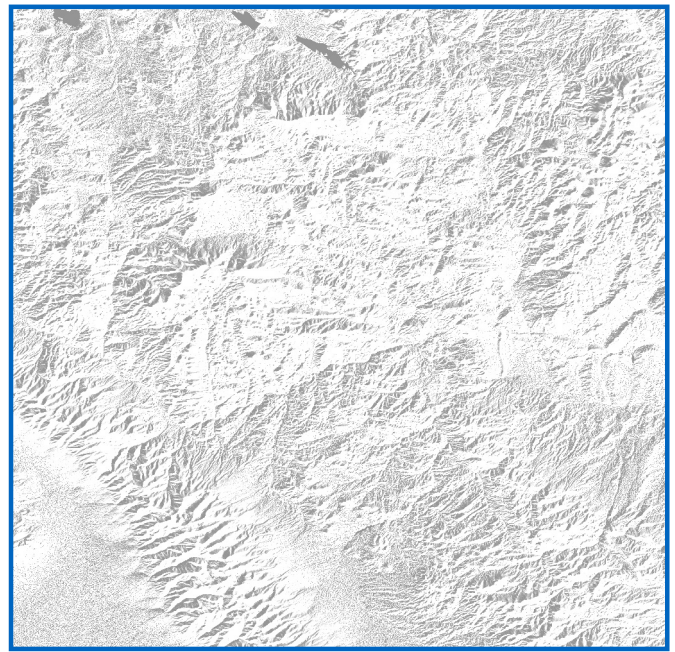


Figure 3

A histogram of flow on Map 7. Here we see that there that flow direction appears to be a mostly random distribution, with maybe a little bit more area in the southeast and northwest directions. It is very similar to, though not the exact same as the aspect map's histogram.

Flow Map

Map 7

A map depicting the flow direction across the landscape of the Greater Canyon City, CO Region using the D8 method. This provides 8 directions of flow and regions with no flow. No flow is black, north is red, northeast is orange, east is yellow-green, south east is green, south is cyan, southwest is blue, west is purple, northwest is magenta.

Flow Direction Histogram

