1
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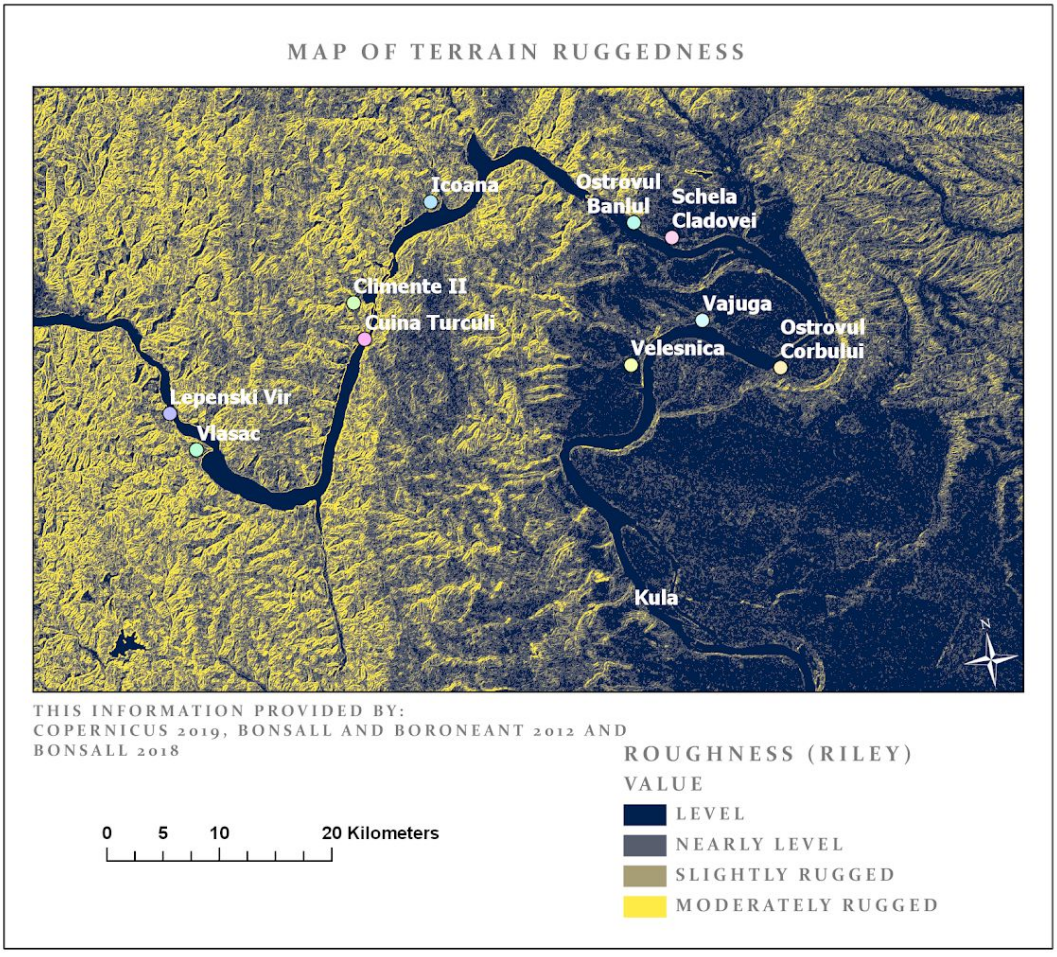
Introduction

In this project I am focusing on the main burial sites within the Iron gate, from the mesolithic period. These sites include Vlasac, Lepenski Vir, Climente II, Kula, and Schela Cladovei. The rationale for choosing this project is that the sites all have different burial practises within the small terrain. This is thought to be due to the landscape being hard to navigate and pass, therefore leading to a spread of tribes and lack of interaction between tribes leading to the use of different mortuary rights taking place (Bonsall and Boroneant 2012) . The 4 maps developed aim to demonstrate if this theory is correct and to provide evidence that helps to provide an understanding of why there are varying burial practises across the sites.

Map 1 - Terrain Roughness



This map is designed to show the roughness of terrain within and around the mesolithic sites. This process was created by first downloading a DEM of the topographic area from Copernicus land monitoring services, then importing the DEM into ArcGisPro. Once the

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DEM was imported into the GIS software the next stage was to snip the DEM section down to just the section that was needed. This is due to the fact that the DEM file was extremely large, this meant that it would be very time consuming when conducting future processes that required the DEM being used. Once this step was completed, the basis for all the maps was set up, allowing me to begin the process of creating terrain roughness.

The process began by going to the tools and creating two focal statistical values. This was done by choosing focal statistics, then inputting the values as shown in figure 1, below.

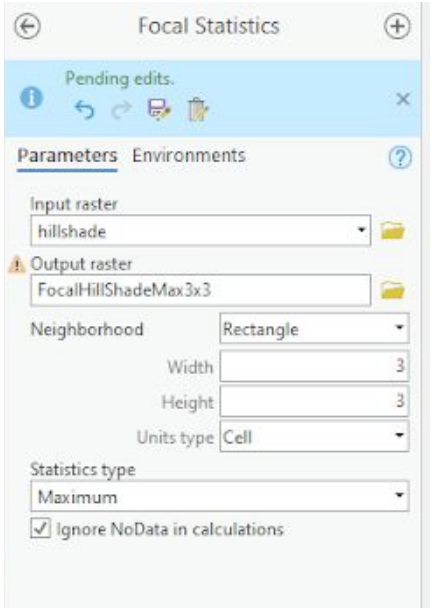

Figure 1 - Focal stats to create Max values for calculation (Authors Own 2020)

The values were then repeated for the minimum values. The two values created then allowed the use of a Raster Calculator, where the equation in figure 2 is inputted with the values.

$$\sqrt{Max\ Mean\ Elevation^2 - Min\ Mean\ Elevation^2}$$

Figure 2 - Calculation to figure out Rileys (Goodchild 2020)

This then allows us to create a Riley output raster. This raster then can be categorised via the values shown in figure 3 and allows me to judge how rough the terrain within the area is, based on the colour values as shown in the map above.

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1	Level	0-80m
2	Nearly level	81-116
3	Slightly rugged	117-161
4	Intermediately rugged	162-239
5	Moderately rugged	240-497
6	Highly rugged	498-958
7	Extremely rugged	959-4367

Figure 3 - Rileys categories (GoodChild Workbook 3 2020)

The next stage was to add the Mesolithic site data to the map in order to gauge the roughness of terrain around these sites. This was done by importing an excel spreadsheet with the spatial coordinates and site names on via the XY table to point tool, which put the sites on the map via the coordinates in the dataset.

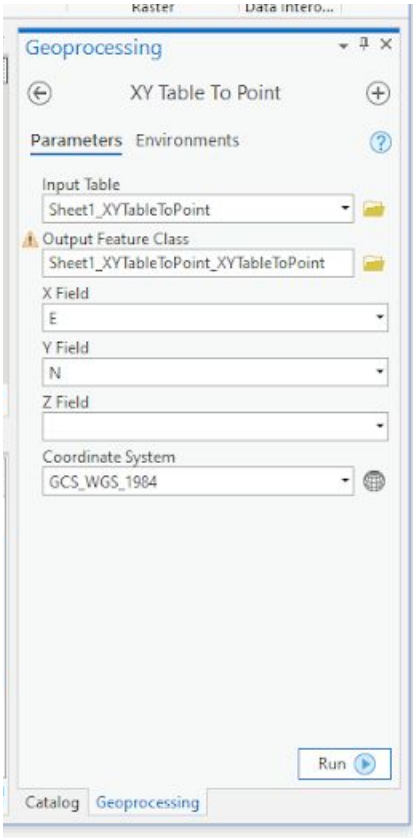

Figure 4 - XY Point inputs (Authors Own 2020)

One Issue I had however, when finding this data, was that there was no official location of the major sites other than Lepenski Vir. The way I worked around this was that I found a map of the major locations(as shown in figure 5) and compared the site plot points against

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a google map of the area. I then roughly estimated the coordinates from the positions, putting them into an excel sheet.

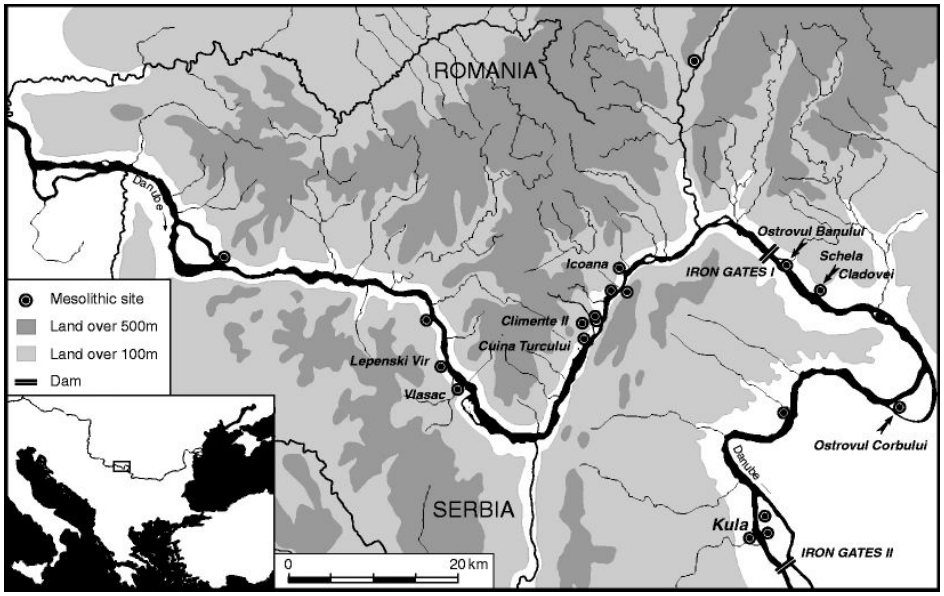

Figure 5 - Map used to place the spatial coordinates of sites (Bonsall and Boroneant 2018)

A flow chart of how the map was created is shown below:

Flowchart 1

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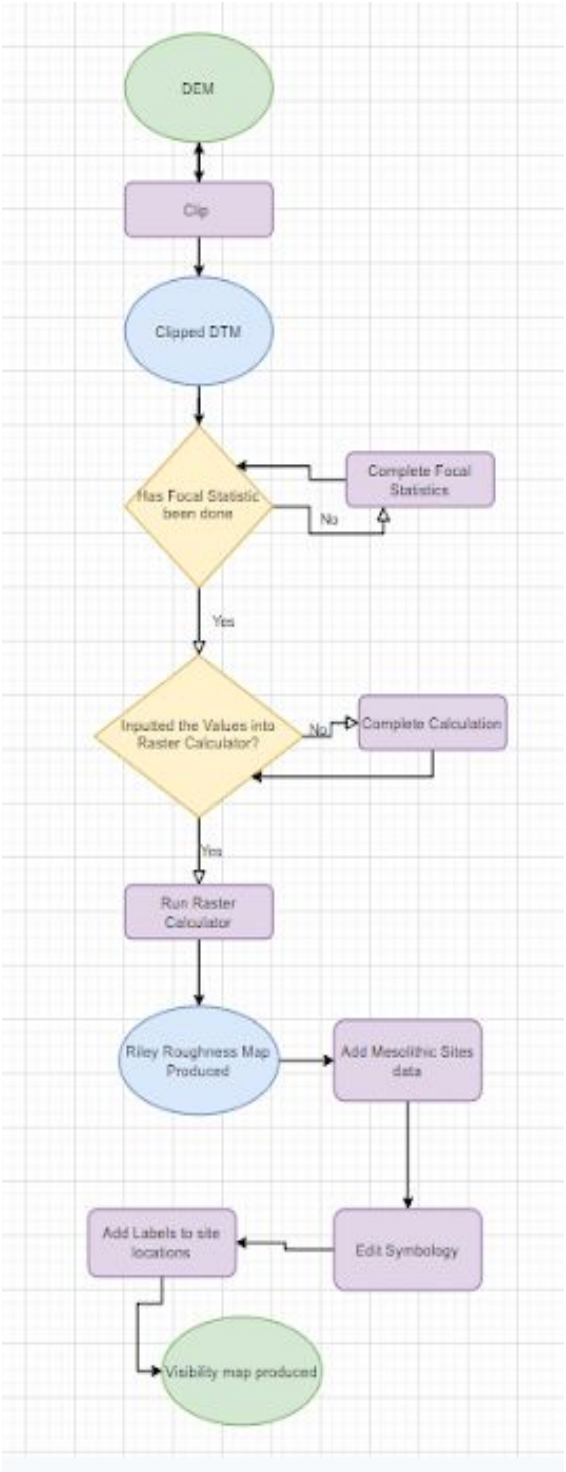

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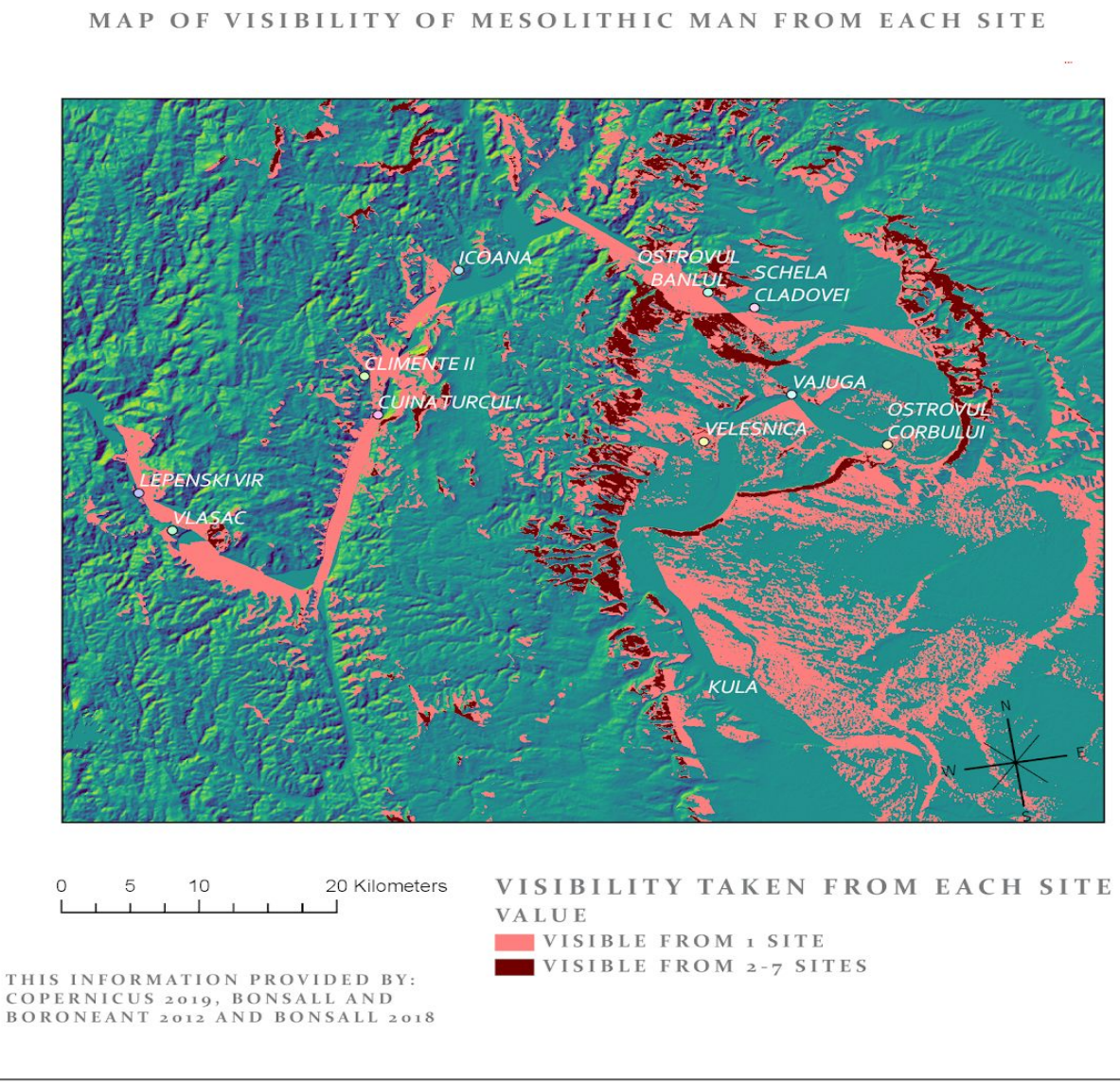
Map 2 - Visibility (Cumulative Viewsheds)



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The second map created above is to view the visibility of the terrain within the Iron Gates region. This map was first created by importing the clipped elevation model into this new map and then adding the mesolithic site data from my catalog, then the next stage was to use the geoprocessing tool visibility (figure 6).

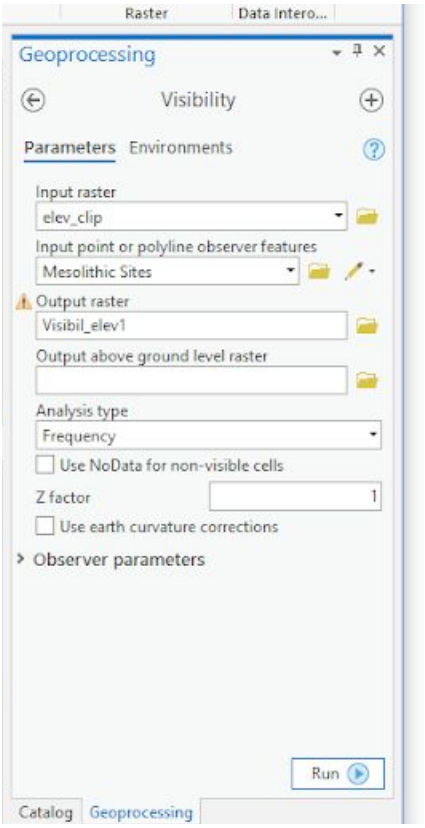

Figure 6 - Visibility inputs (Authors Own 2020)

The geoprocessing tool calculates the visibility of the land from the mesolithic site locations, from the DEM clip section and the input points of the mesolithic sites, from the average height of a mesolithic man (1.6m), due to the observer offset being 1.6. This then produces the gradient of red shown on the map that shows when a sight is only visible from 1 spot (Light red) to visible from 2 or more sites (Dark red). This information then tells us that there are areas hard to spot from each site. This helps to support the theory that the tribes did not come into contact with each other because of the terrain.

Flowchart 2

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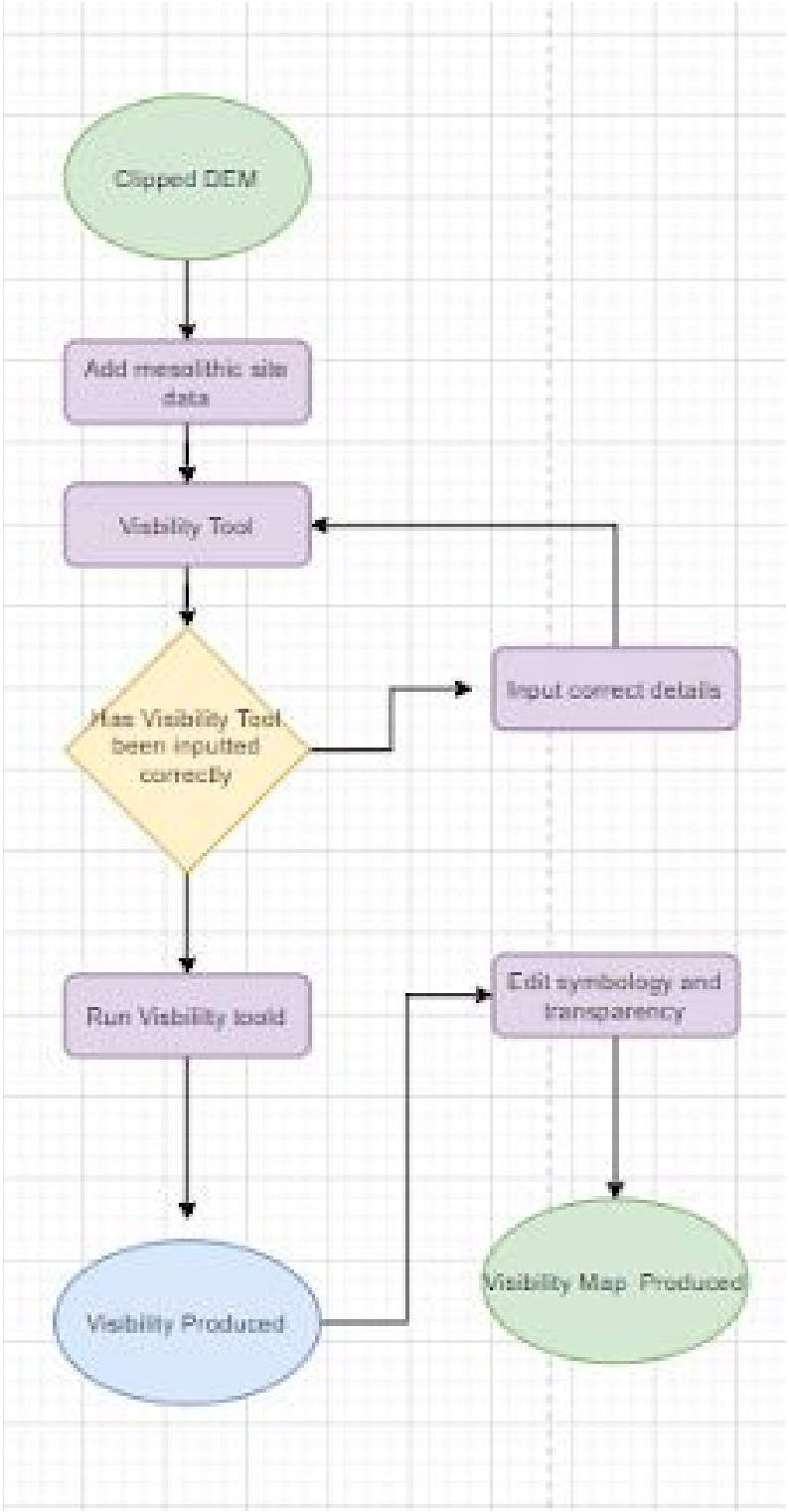

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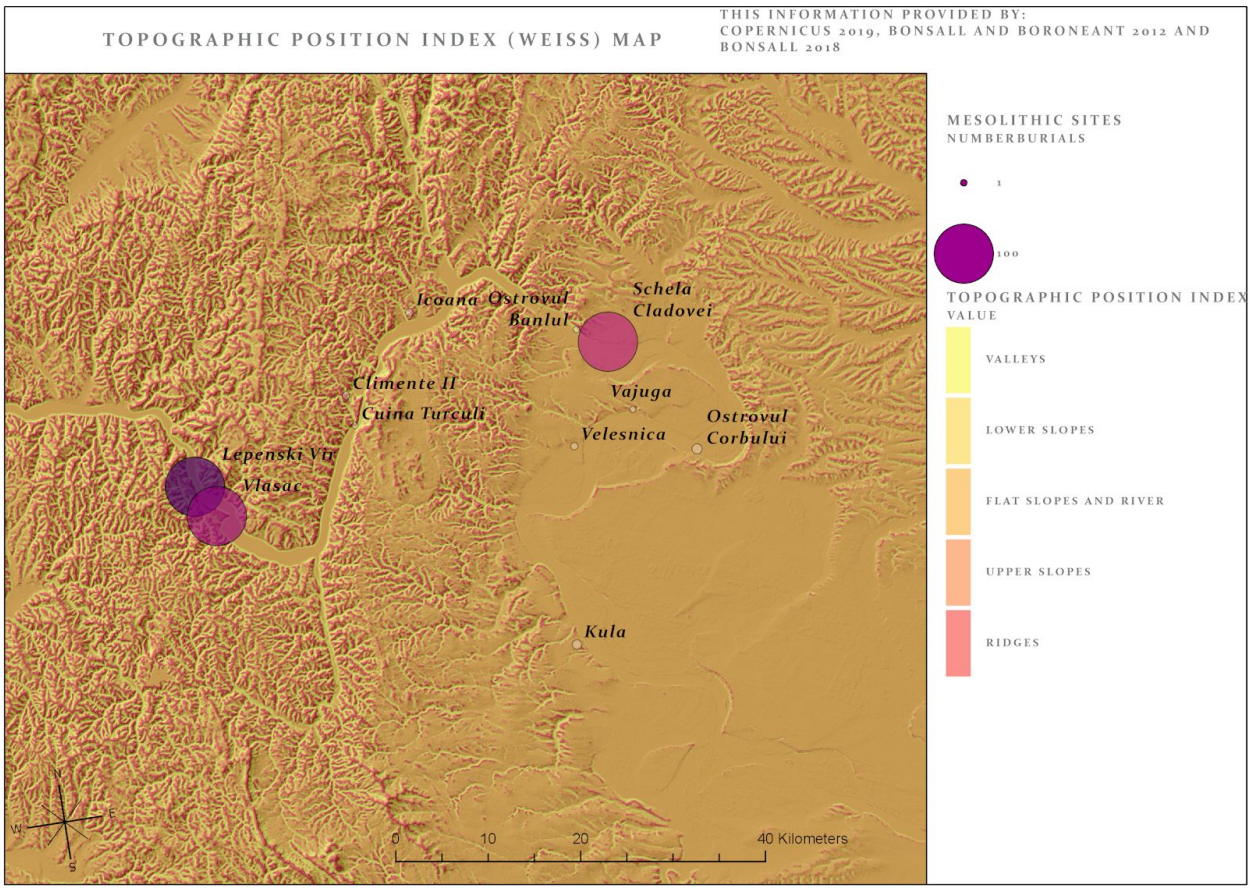
Map 3 - Quantities Map or Topographic Position Index (Weiss)



The third map is a topographic position index (Weiss), combined with a quantities map. This map displays the amount of burials at each site depending on quantity. This was done by first importing the DEM of the area and the mesolithic sites data into the new map design, then using focal statistics on the DEM layer with an annulus window of 150 and 300 creating the mean DEM.

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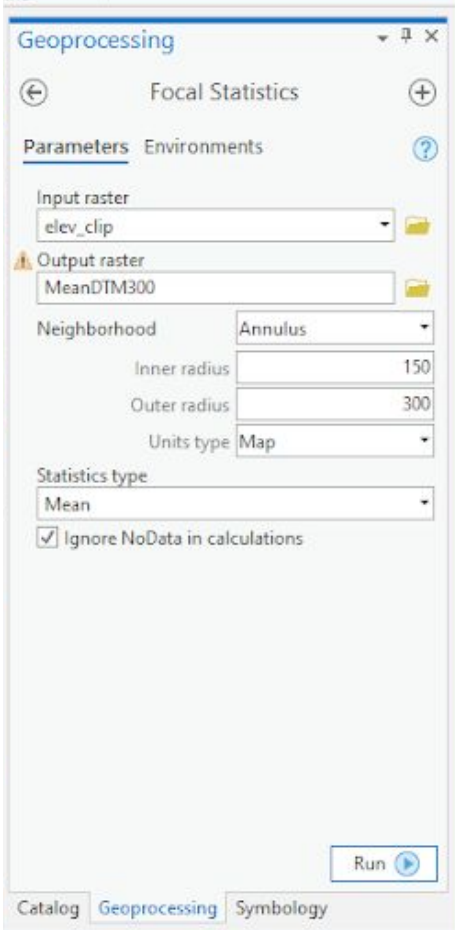

Figure 7 - Focal stats creating the mean Digital Elevation Model for calculator (Authors Own 2020)

This value was then used in Raster Calculator to subtract from the original DEM providing the topographic position index. The next stage was to edit the symbology of the TPI and work out the class values for the different labels, using the standard deviation and the mean, as shown in figure 8. This then produced the topographic position values.

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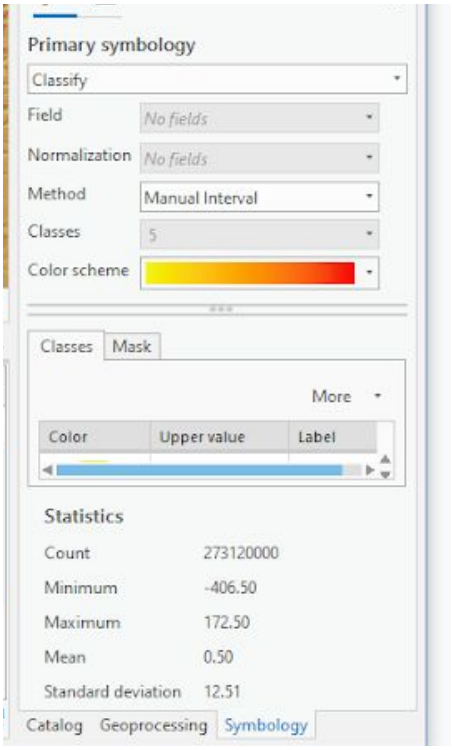

Figure 8 - Finding the standard deviation and the mean for calculations (Authors Own 2020)

Then the next stage was to add the quantities, in relation to the number of burials, to the mesolithic sites. This was done by using Borral and Boreant 2018 data as shown in figure 9. Then changing the symbology to proportional symbols. This then produced the map points as shown above on map 3. However for the site Cuina Turcului, with a question mark in the data, I still inputted 1 burial as data in the map. This is because the field value was a ? and to make the quantities symbology, the data needs to be values and can not be string.

Site	Number of burials	MNI	Mesolithic (Epipalaeolithic)	Early Neolithic
1. Ajmana[1]	1	17		•
2. Climente II	2	2	•	?
3. Cuina Turcului	?	6	•	•
4. Gornea	2	2		•
5. Hajdučka Vodenica	32	46+	•	
6. Icoana	3	3	•	
7. Kula	5	5	•	?
8. Lepenski Vir[2]	128	184	•	•
9. Ostrovul Corbului[3]	6	9	•	?
10. Padina	51	48+	•	
11. Schela Cladovei[2]	90	100+	•	?
12. Ušće Kameničkog potoka[1]	1	1		•
13. Vajuga-Pesak (trench XV)[1]	1	1		•
14. Velesnica	2	7		•
15. Vlasac	104	206	•	?
TOTAL:	**425**	**637+**		

Figure 9 - Table with burial data (Bonsall and Boroneant 2012)

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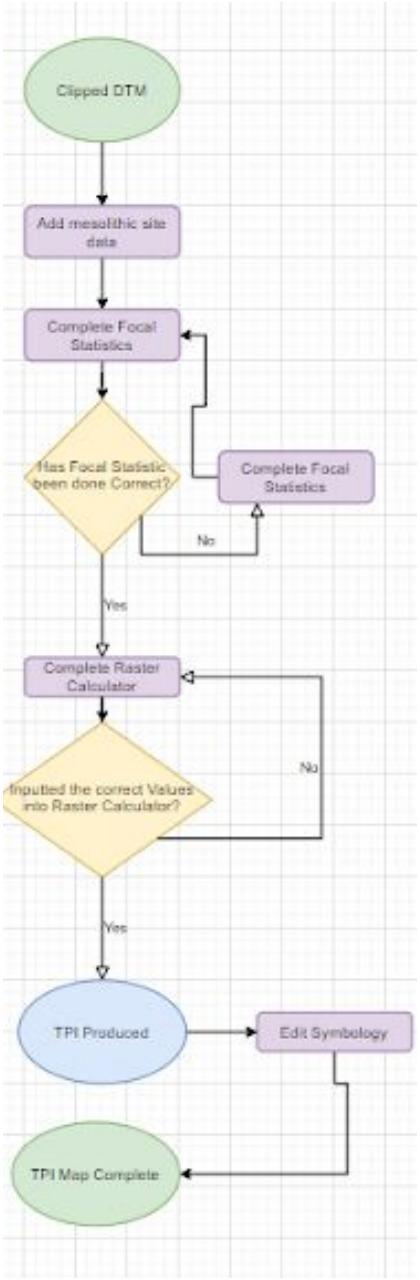
Flowchart 3



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Map 4 - Location

The final map design is a location map. This is a simple map that shows the location of the mesolithic sites in relation to the world they are in. This map uses the topographic world view to provide a map style view of the location with the countries locations identified. There is a second map which in terms of the layout extends from the first map which shows the region of the Danube River where the Iron gate burial sites are located. This creates the box

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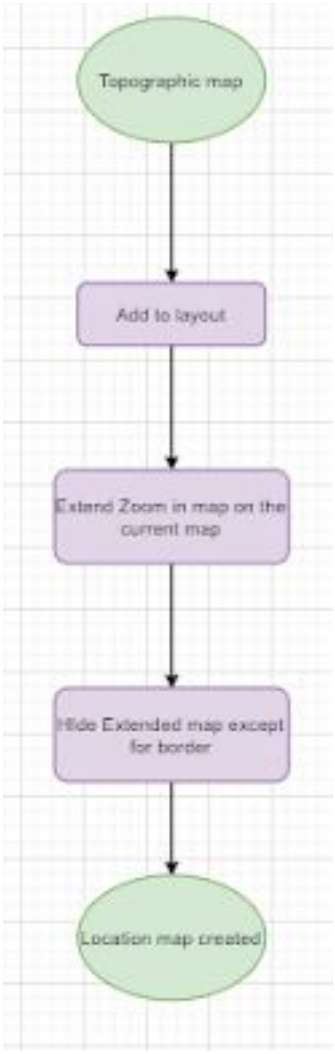
shape as shown on the map above. As this is a simple map , it requires a simple flow diagram as below ,

Flowchart 4



Conclusion

To conclude, the 4 maps created aim to help develop an understanding about differences in burial practises amongst the Mesolithic tribes within the Iron gates site. They can be used to help support the theory that variation in burial practises may have been due to the fact that different tribes did not have any contact with each other as a result of the surrounding terrain. When we look at the 4 maps, Ruggedness, Visibility, TPI and location, it is clear the terrain could be a potential barrier and reason why tribes could not communicate and make contact with each other, resulting in different mortuary practises at the sites. This

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information has therefore helped to support and reinforce thinking and so help aid the theory that the Mesolithic tribes had differing burial practices due to the environment and landscape around them limiting communication within the Iron Gates area.It also demonstrates the importance and usefulness of spatial analysis in GIS for use in archaeological discoveries.

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