

# Basic Raster Operations



ISTANBUL **TECHNICAL** UNIVERSITY

Sp. Anly. and Alg. in GIS

Week 2

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# Introduction & Aim of the Study

- *Determine the probable nesting locations of Siberian goose in the Istanbul's European Side. Siberian goose is a rare bird type that is thought to make its nests on gentle or moderate slope areas near the sea.*

## *Aim of the Study:*

- *Find the available nesting locations of Siberian goose by considering the followings:*
  - *1000 km near the sea*
  - *Gentle or moderate slope areas*
  - *NE direction of aspect*

## *Input Data:*

- *Land cover/use map of a part in the European side of Istanbul (Raster/img)*
- *Digital Elevation Model (Raster/img)*

# Exploring Data



lab2 - QGIS

Project Edit View Layer Settings Plugins Vector Raster Database Web Mesh MMQGIS Processing Help

Drag landuse.img, ist\_dem.img to the QGIS Layers window.

**Layers Panel**

- landuse
- ist\_dem

**Browser Panel**

- Favorites
- C:\Users\OmrAkn\Desktop
- C:\Users\OmrAkn\Documents
- C:\Users\OmrAkn\Downloads
- C:\Users\OmrAkn\Dropbox\GISAlg2020
- D:\T\Shawn\OneDrive - itu.edu.tr\Jobs\TU
- D:\T\Shawn\OneDrive - itu.edu.tr\Univers
- D:\T\Shawn\OneDrive - itu.edu.tr\Veriler
- Spatial Bookmarks
- Home
- C:\
- D:\
- GeoPackage
- Spatialite
- PostGIS
- MSSQL
- Oracle
- DB2
- WMS/WMTS
- XYZ Tiles
- OpenStreetMap
- WCS
- WFS
- OWS
- ArcGISMapServer
- ArcGISFeatureServer

**Processing Toolbox**

- Recently used
- Cartography
- Database
- File tools
- Graphics
- Interpolation
- Layer tools
- Network analysis
- Raster analysis
- Raster terrain analysis
- Raster tools
- Vector analysis
- Vector creation

Coordinate: 410751,4550692 Scale: 1:113829 Magnifier: 100% Rotation: 0.0° Render USER:100026



# Data Properties



Layer Properties — ist\_dem — Information

Information

Source

Symbology

Transparency

Histogram

Rendering

Temporal

Pyramids

Metadata

Legend

QGIS Server

### Information from provider

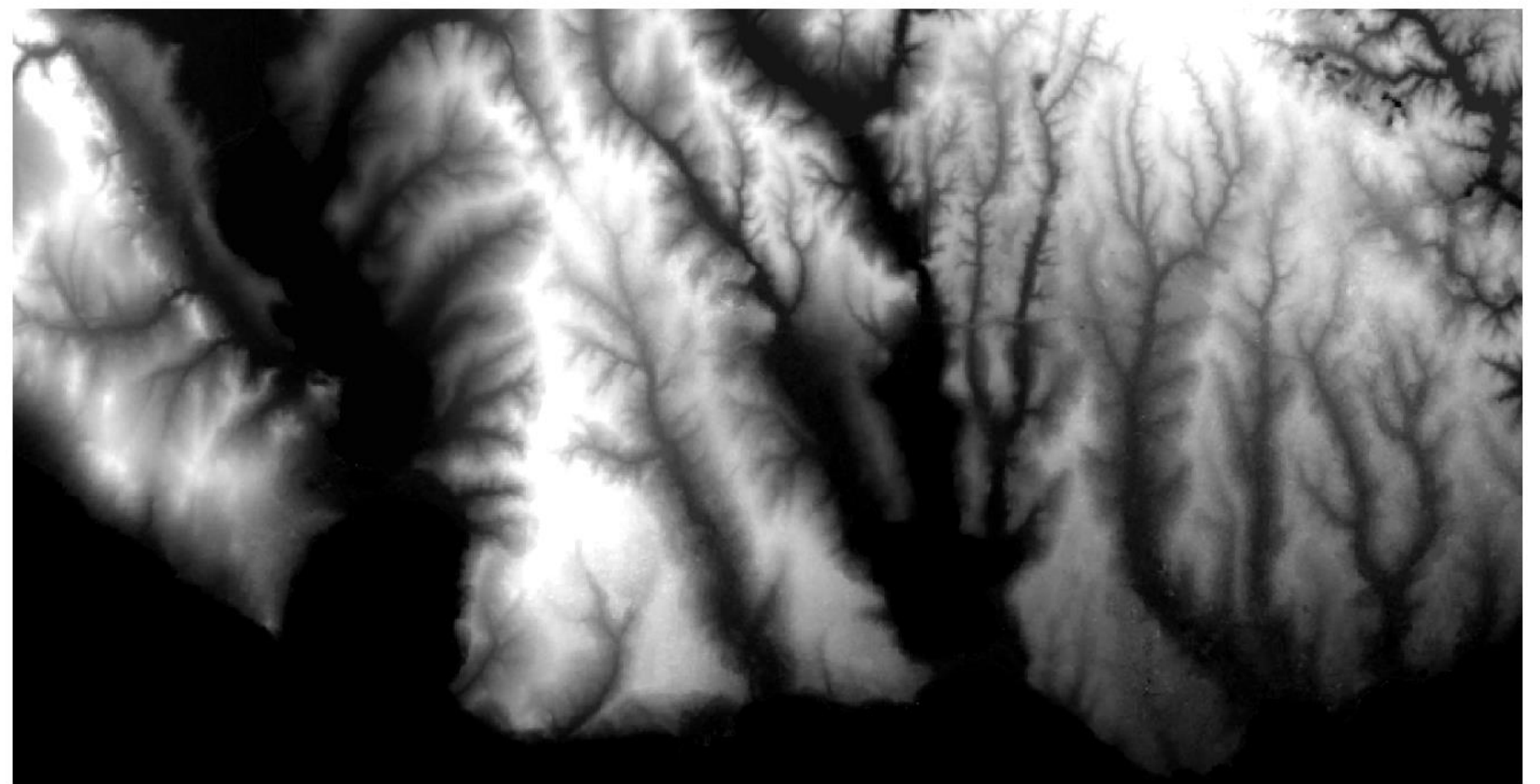
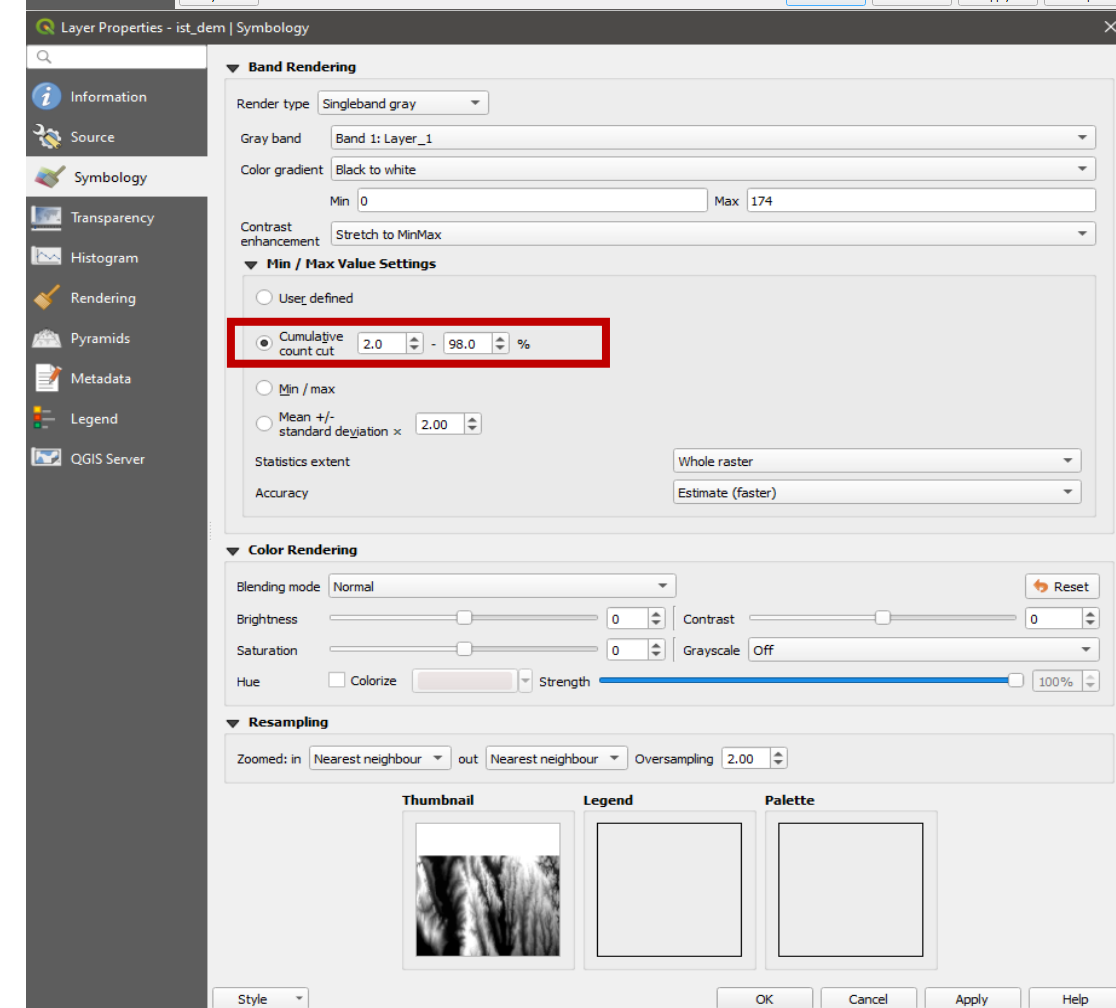
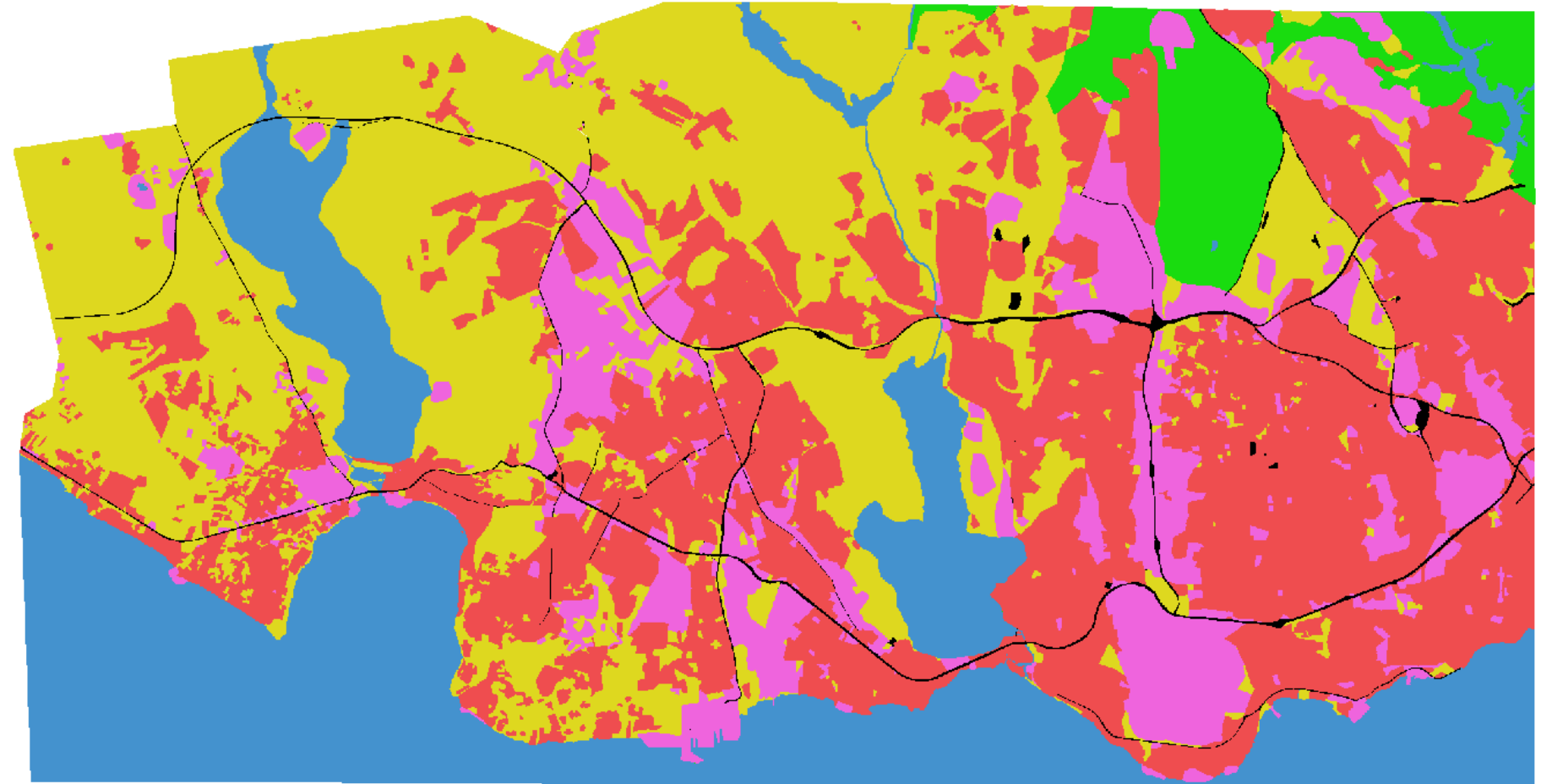
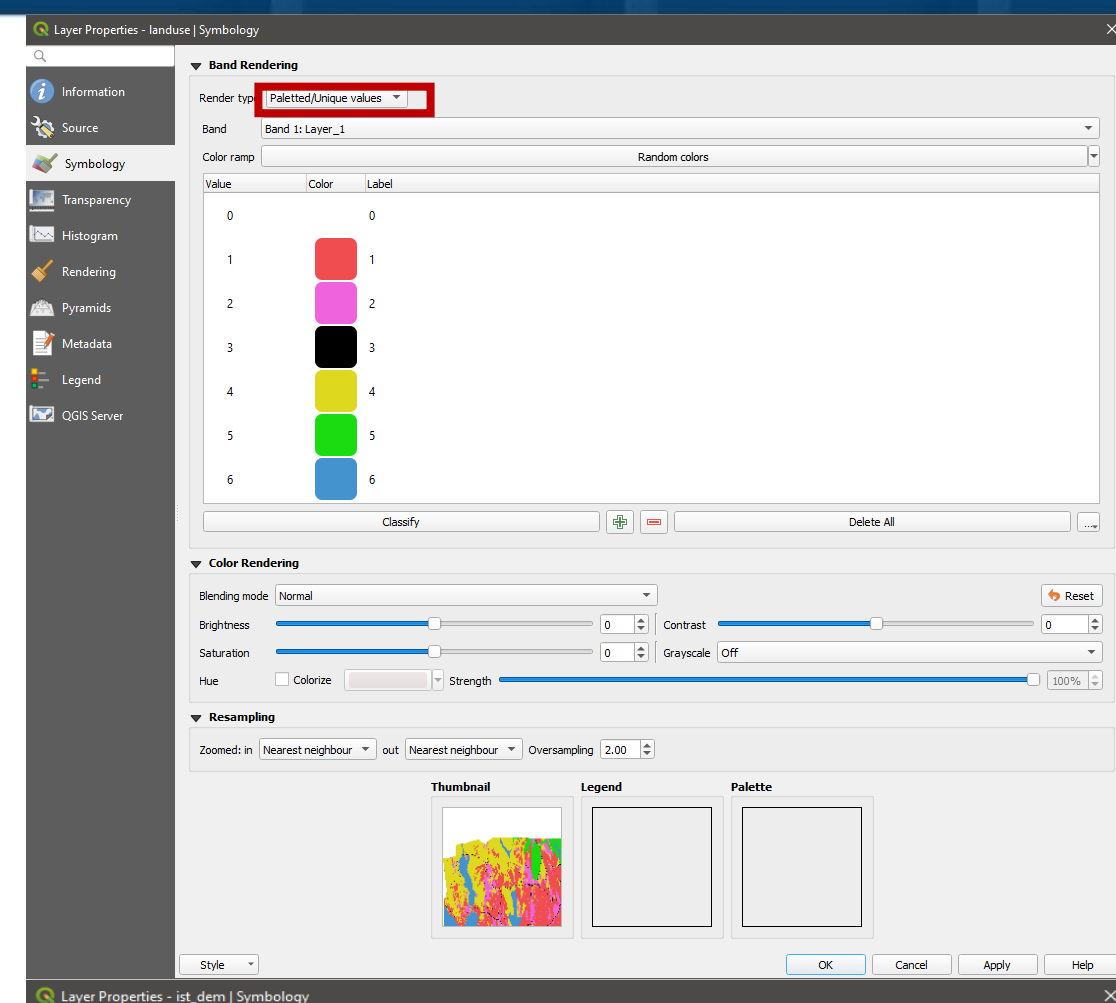
<b>Name</b>	ist_dem
<b>Path</b>	
<b>CRS</b>	WGS_1984_Transverse_Mercator - Projected <b>Coordinate System</b>
<b>Extent</b>	370361.0000000000000000,4536015.0000000000000000 : 410001.0000000000000000,4556455.0000000000000000
<b>Unit</b>	meters
<b>Width</b>	1982
<b>Height</b>	1022
<b>Data type</b>	UInt32 - Thirty two bit unsigned integer
<b>GDAL Driver Description</b>	HFA
<b>GDAL Driver Metadata</b>	Erdas Imagine Images (.img) <b>Format</b>
<b>Dataset Description</b>	
<b>Compression</b>	
<b>Band 1</b>	<ul style="list-style-type: none"><li>LAYER_TYPE=athematic</li><li>SourceBandIndex=0</li><li>STATISTICS_APPROXIMATE=YES</li><li>STATISTICS_MAXIMUM=230</li><li>STATISTICS_MEAN=64.647114415323</li><li>STATISTICS_MINIMUM=0</li><li>STATISTICS_STDDEV=55.965348586688</li><li>STATISTICS_VALID_PERCENT=100</li></ul>
<b>More information</b>	<ul style="list-style-type: none"><li>DataType=Generic</li><li>X : 991</li><li>Y : 511</li><li>X : 496</li><li>Y : 256</li><li>X : 248</li><li>Y : 128</li></ul>
<b>Dimensions</b>	X: 1982 Y: 1022 Bands: 1
<b>Origin</b>	370361,4.55646e+06
<b>Pixel Size</b>	20,-20 <b>Spatial Resolution</b>

# Available Raster Data Exchange Formats in QGIS



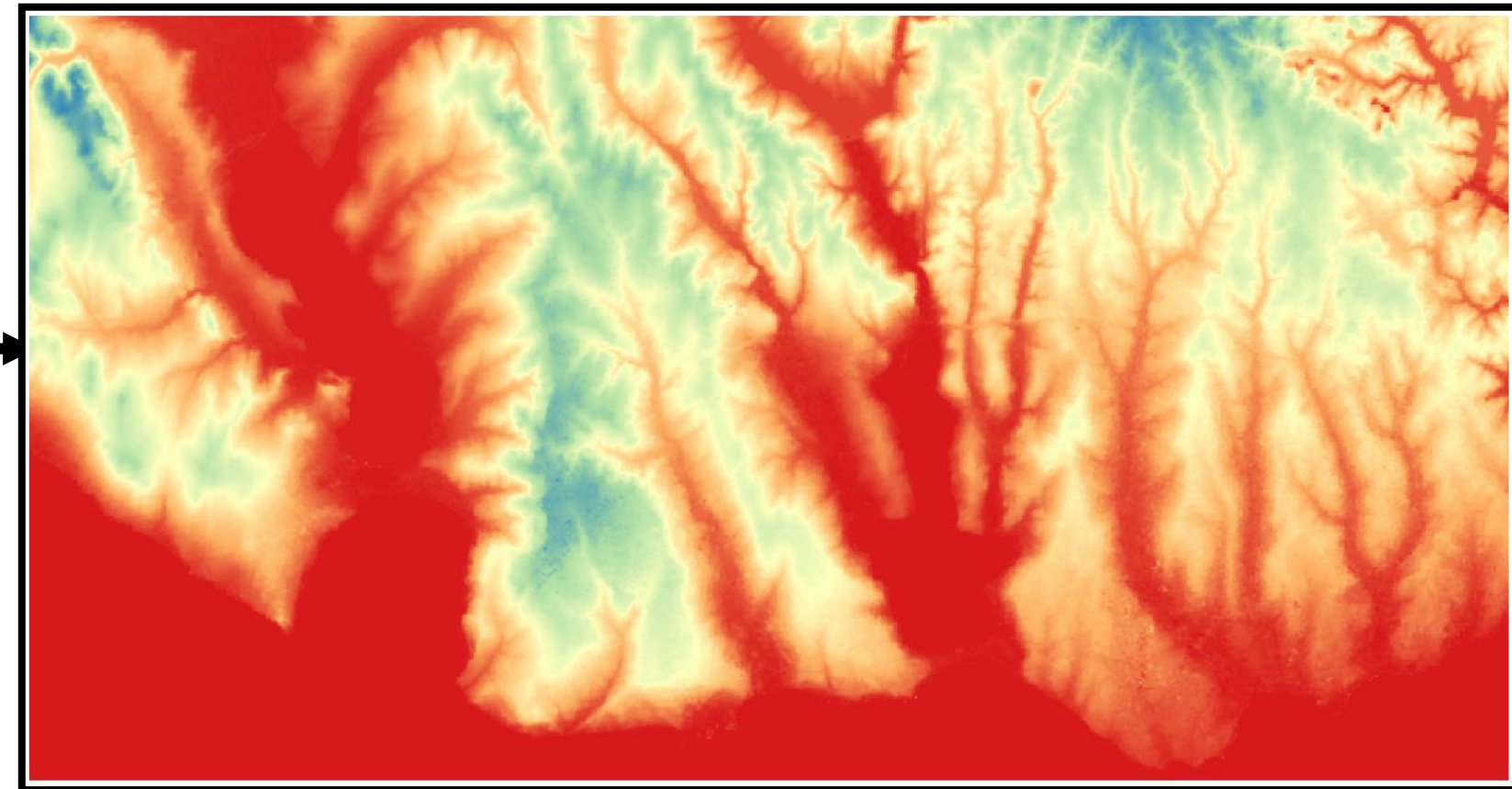
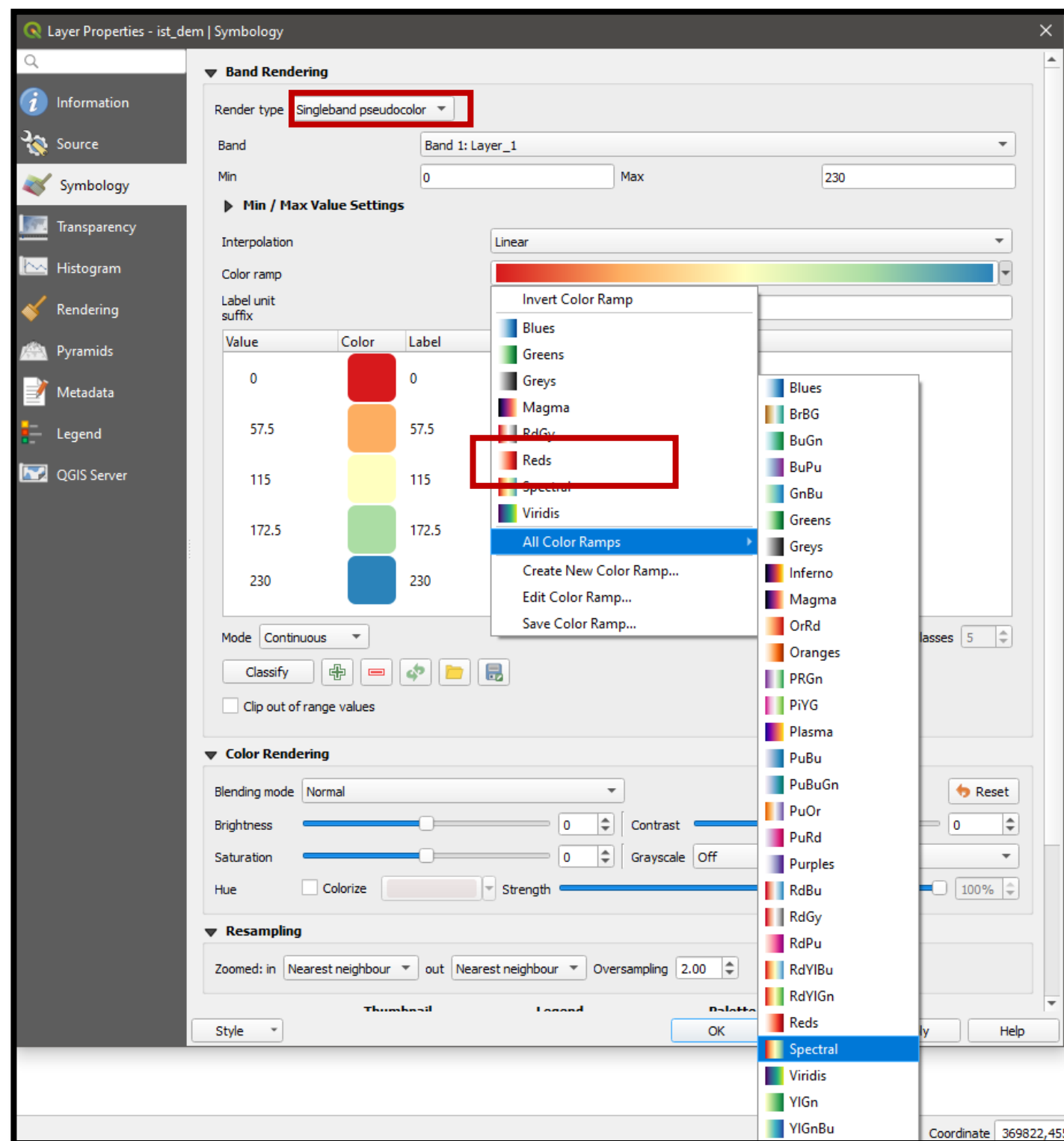
- ArcInfo ASCII Grid (.asc)
- Erdas Imagine (.img)
- GeoTIFF (.tif/.tiff)
- JPEG/JPEG-2000 (.jpg/.jpeg/.jp2/.j2k)
- Portable Network Graphics (.png)
- RasterLite (.sqlite)
- USGS Optional ASCII DEM (.dem)

# Setting up Sembologies



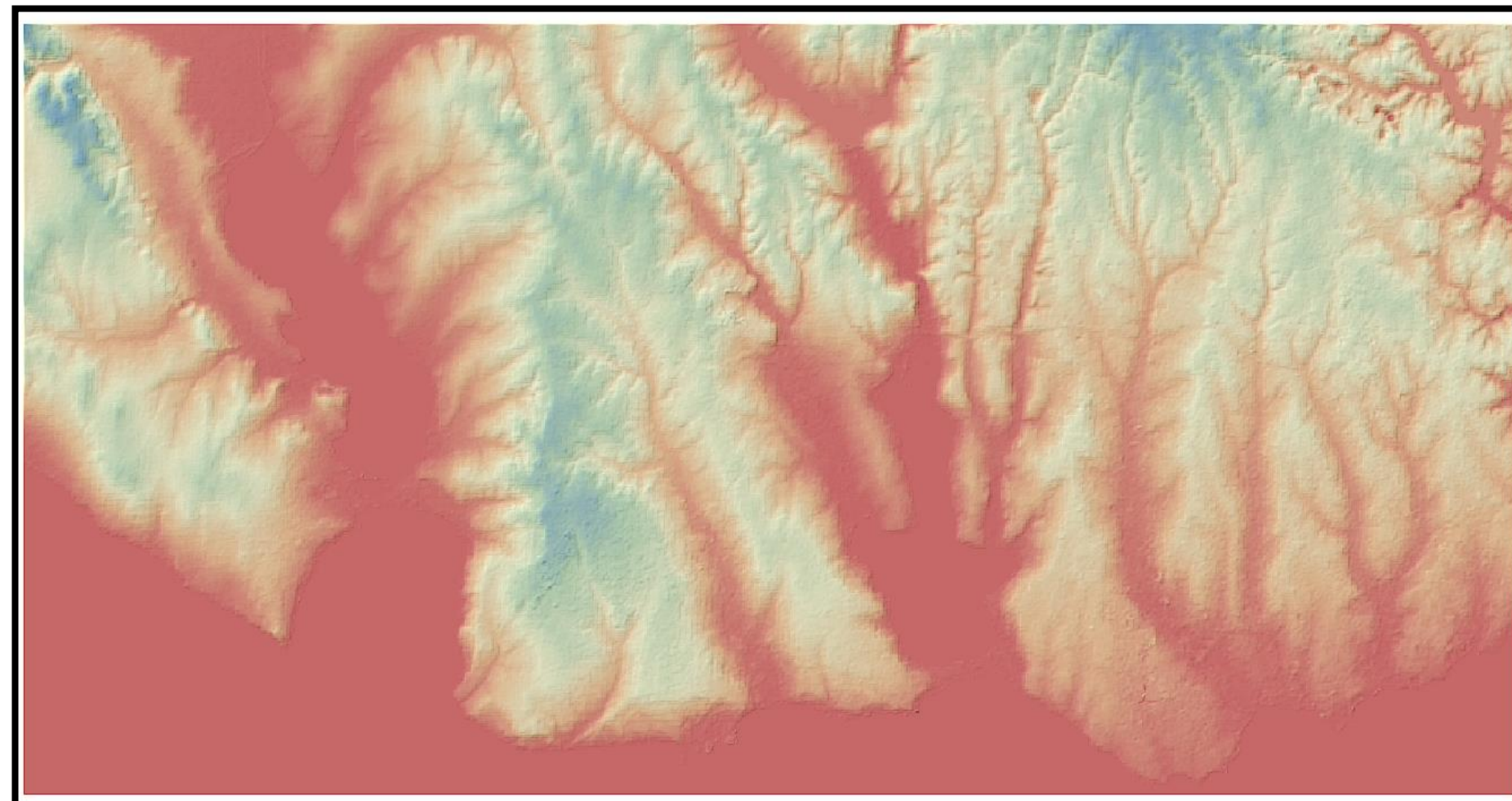
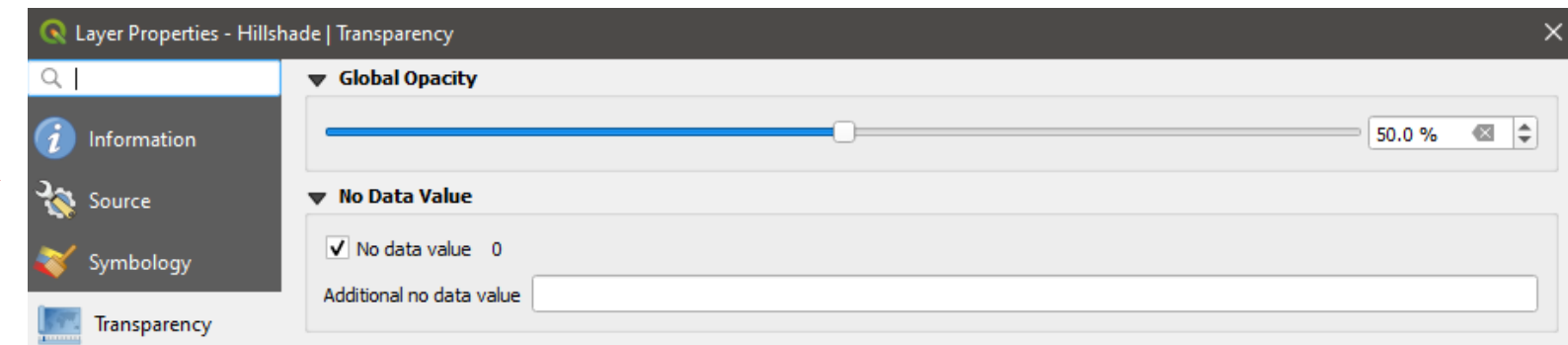
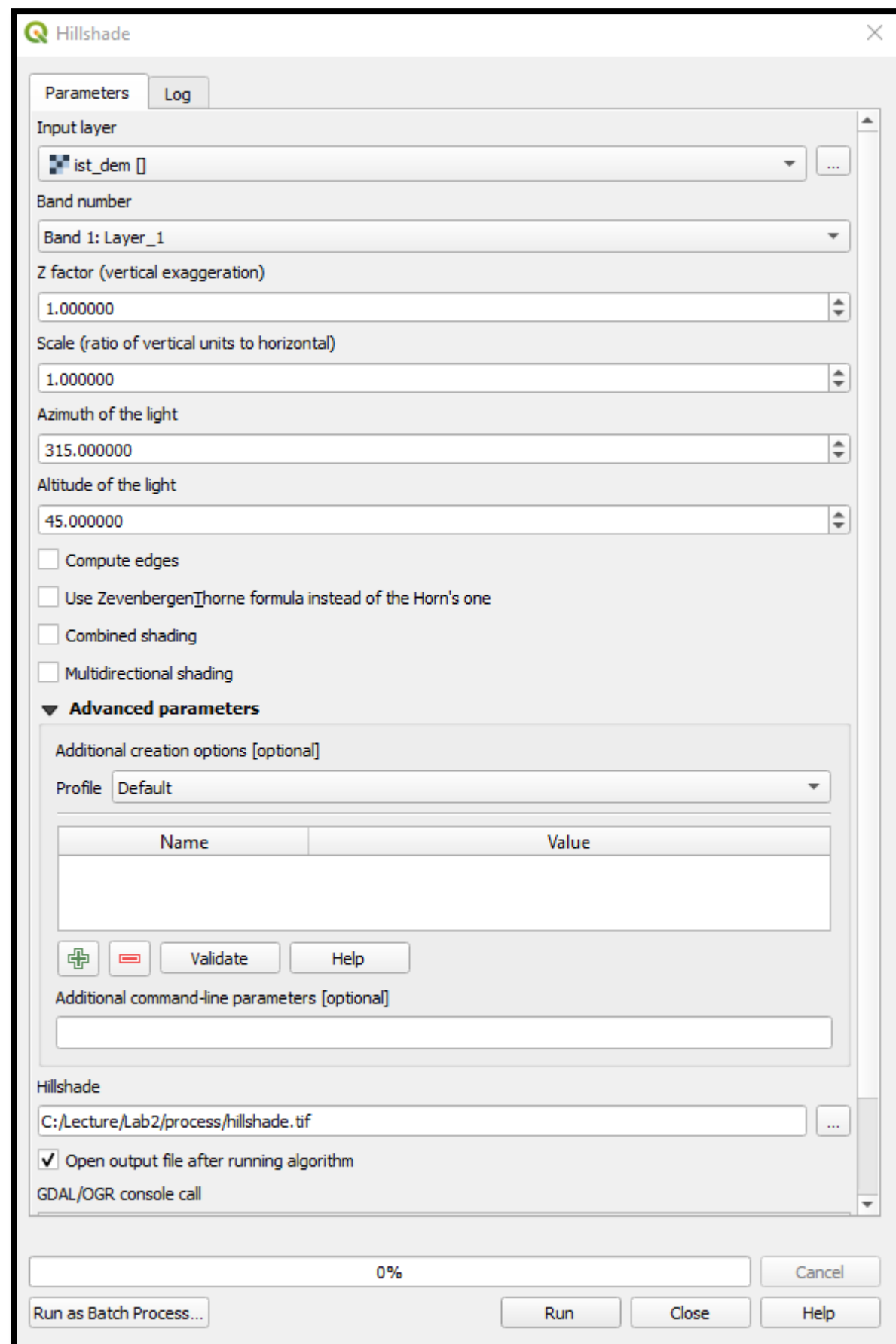


# Advanced Symbology for DEM



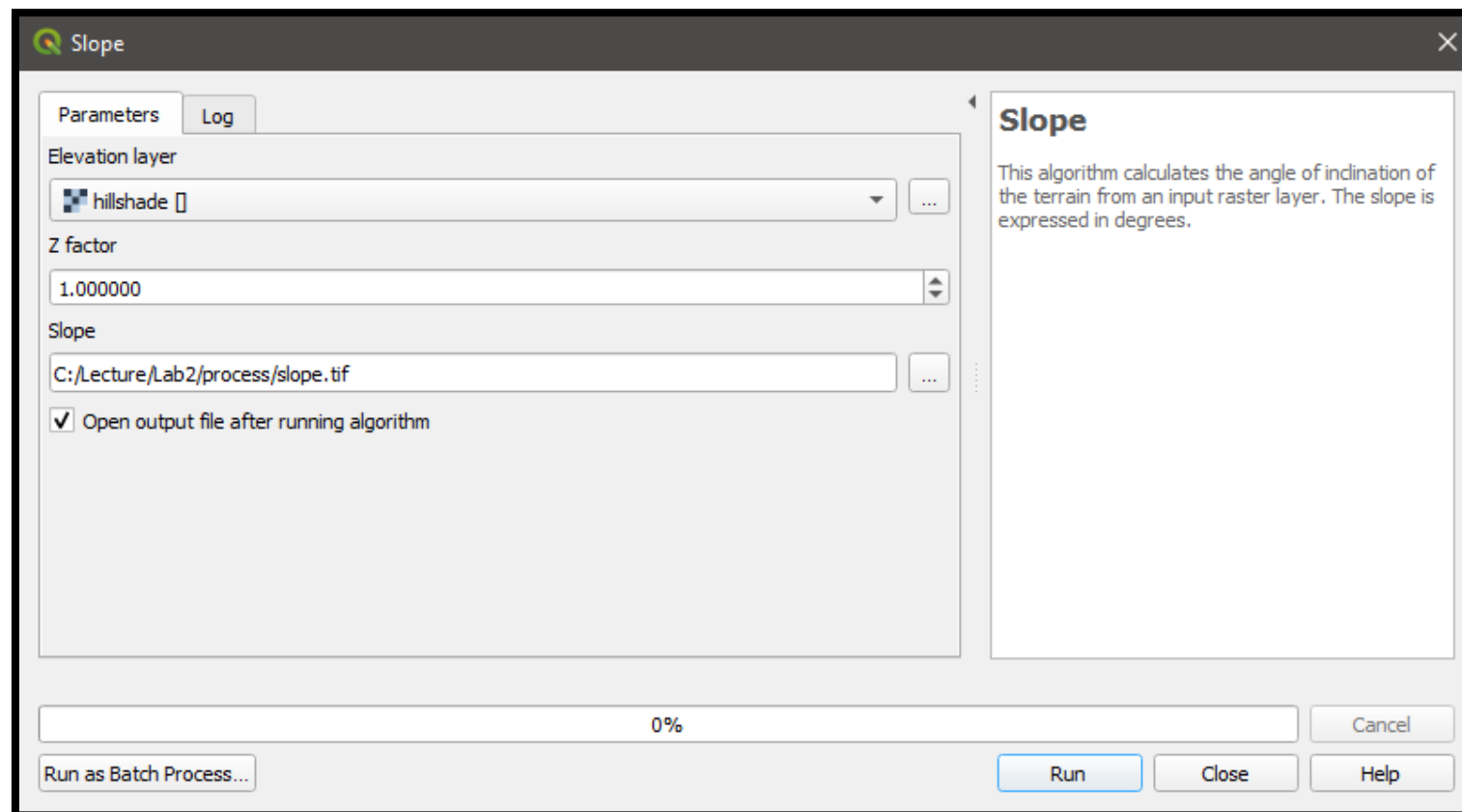
# Hillshade Analysis

- Create a hillshade effect for DEM

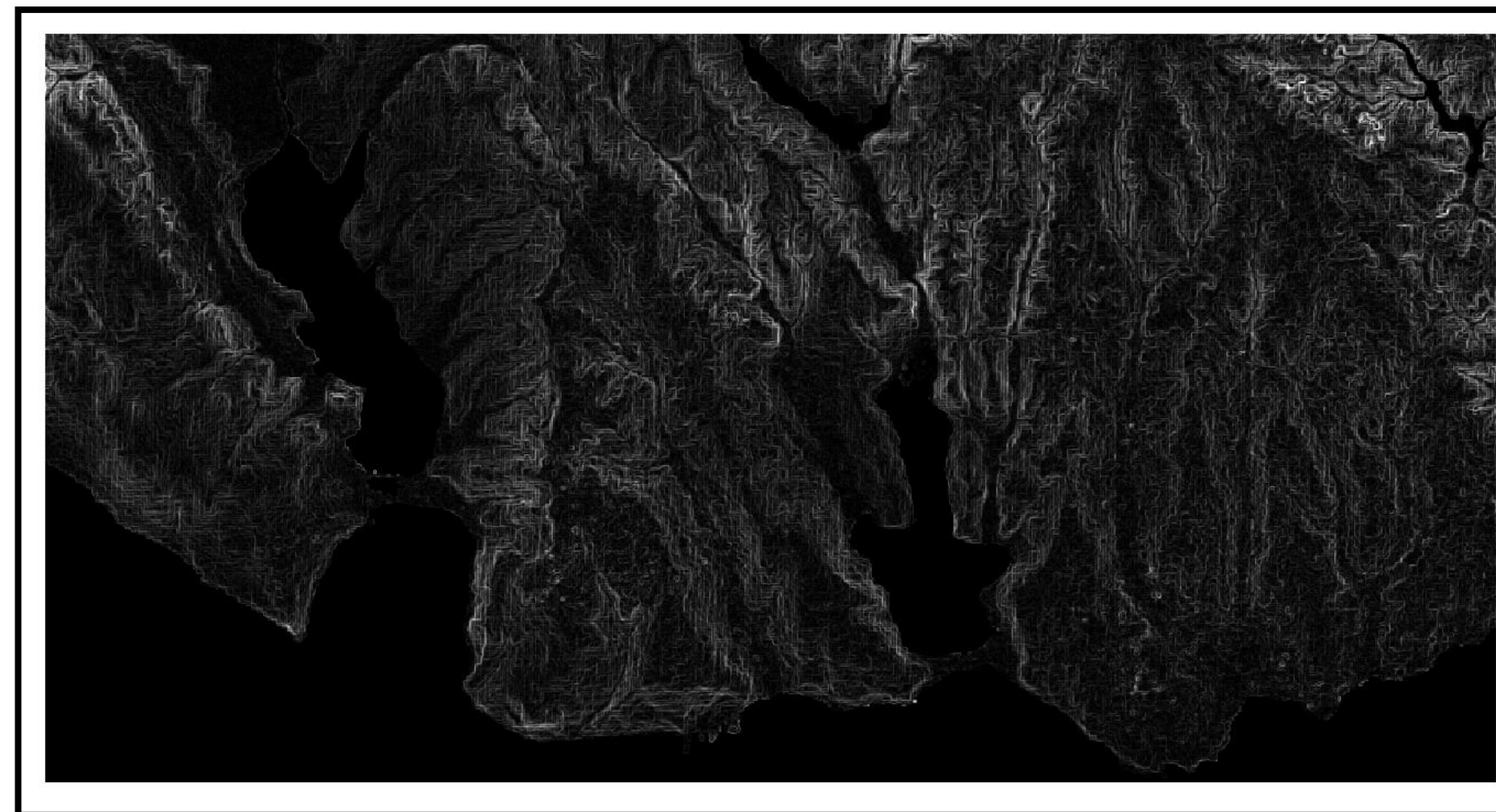




# Slope Analysis

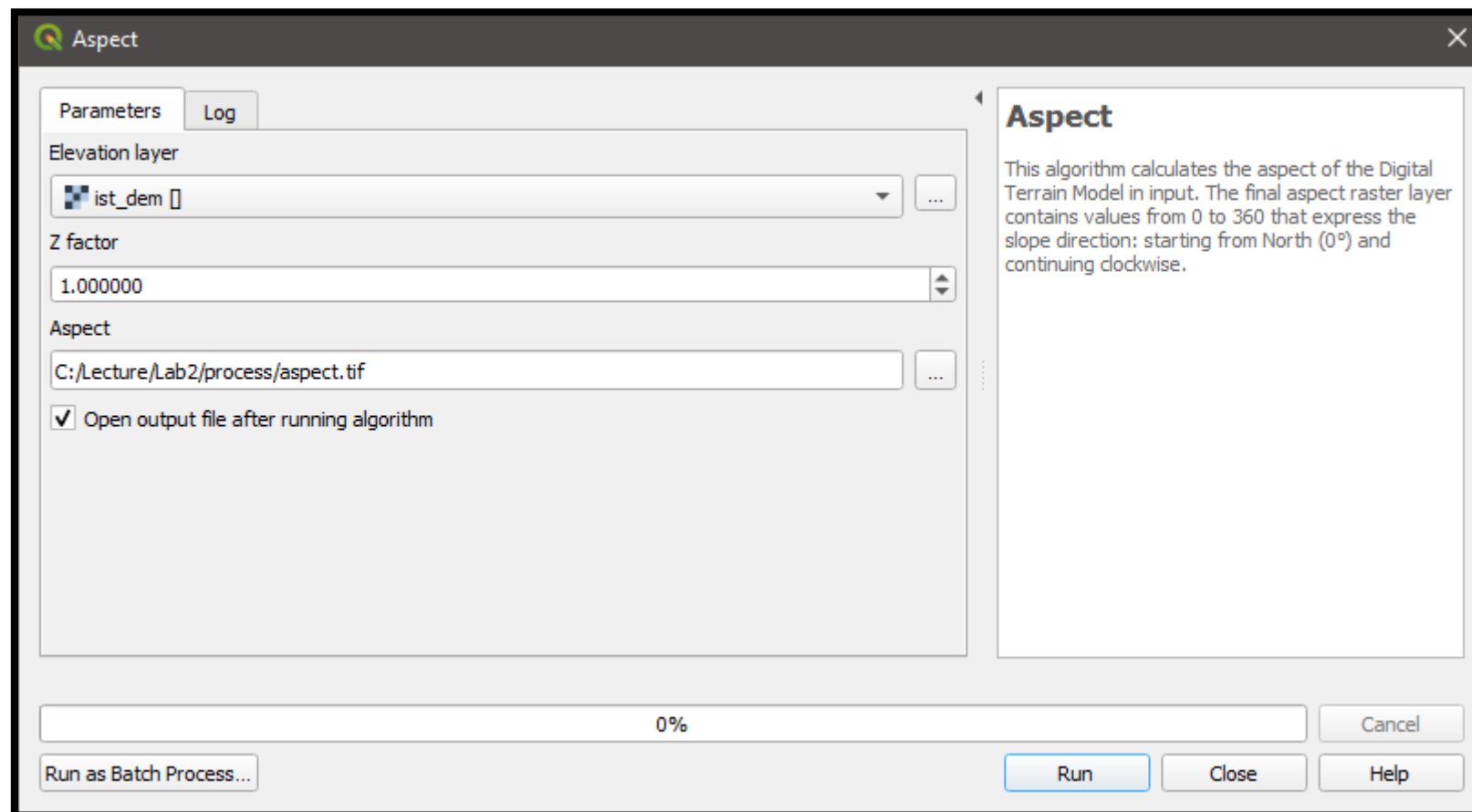


Slope (%)	Approx. Degrees	Terminology
0.0–0.5	0.0	Level
0.5–2.0	0.3–1.1	Nearly level
2.0–5.0	1.1–3.0	Very gentle slope
5.0–9.0	3.0–5.0	Gentle slope
9.0–15.0	5.0–8.5	Moderate slope
15.0–30.0	8.5–16.5	Strong slope
30.0–45.0	16.5–24.0	Very strong slope
45.0–70.0	24.0–35.0	Extreme slope
70.0–100.0	35.0–45.0	Steep slope
> 100.0	> 45.0	Very steep slope



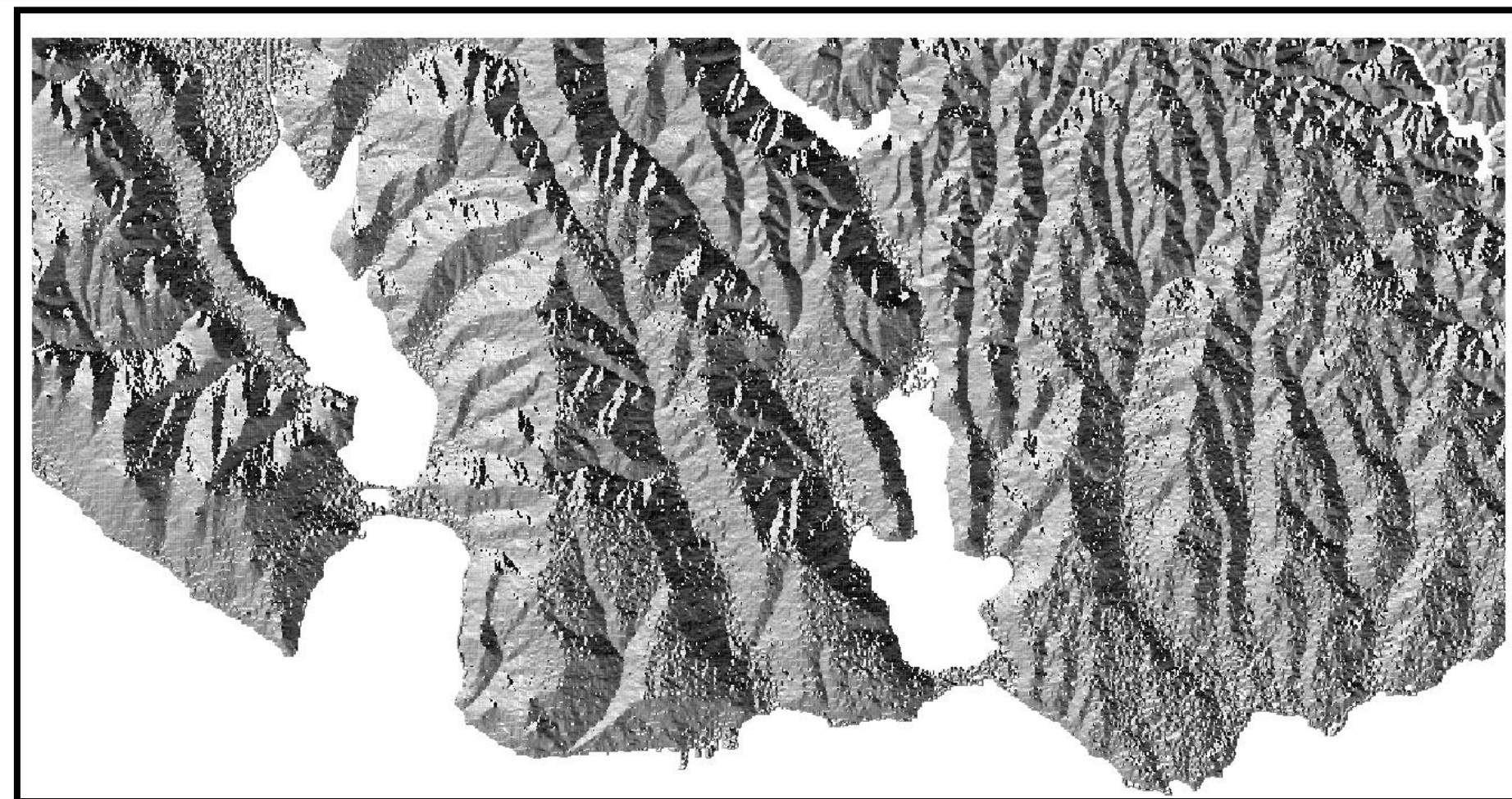
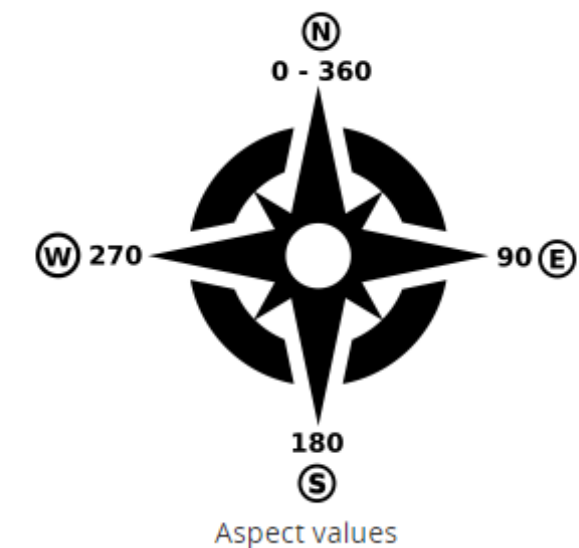


# Aspect Analysis



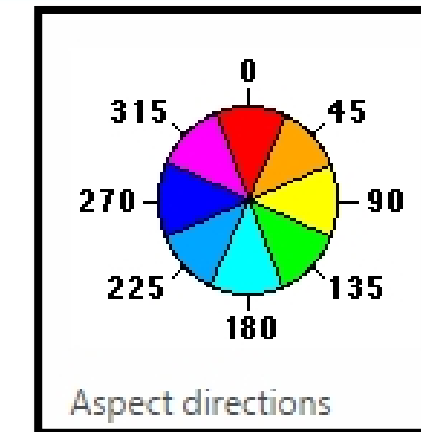
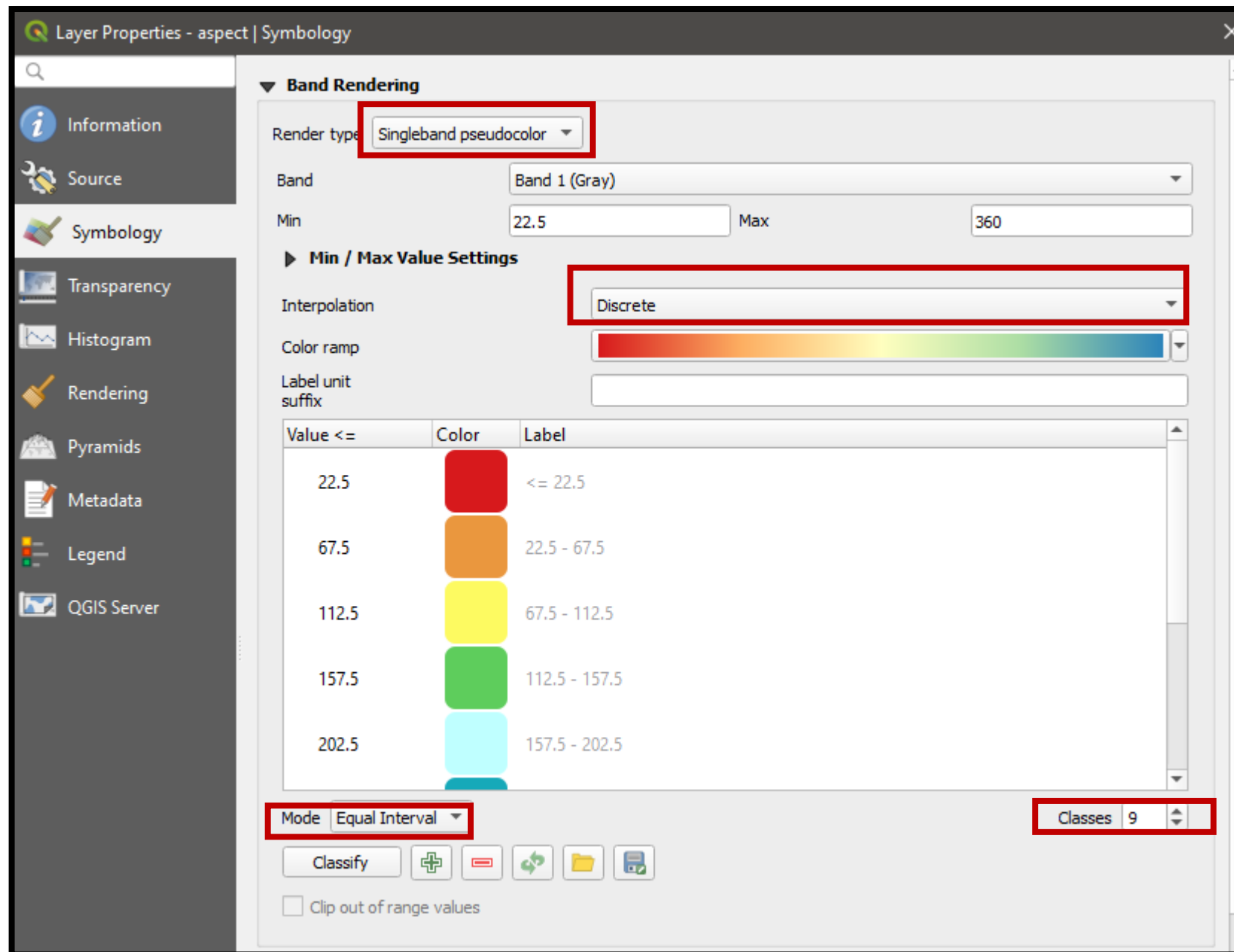
## Aspect

Calculates the aspect of the Digital Terrain Model in input. The final aspect raster layer contains values from 0 to 360 that express the slope direction: starting from North (0°) and continuing clockwise.





# Aspect Symbology

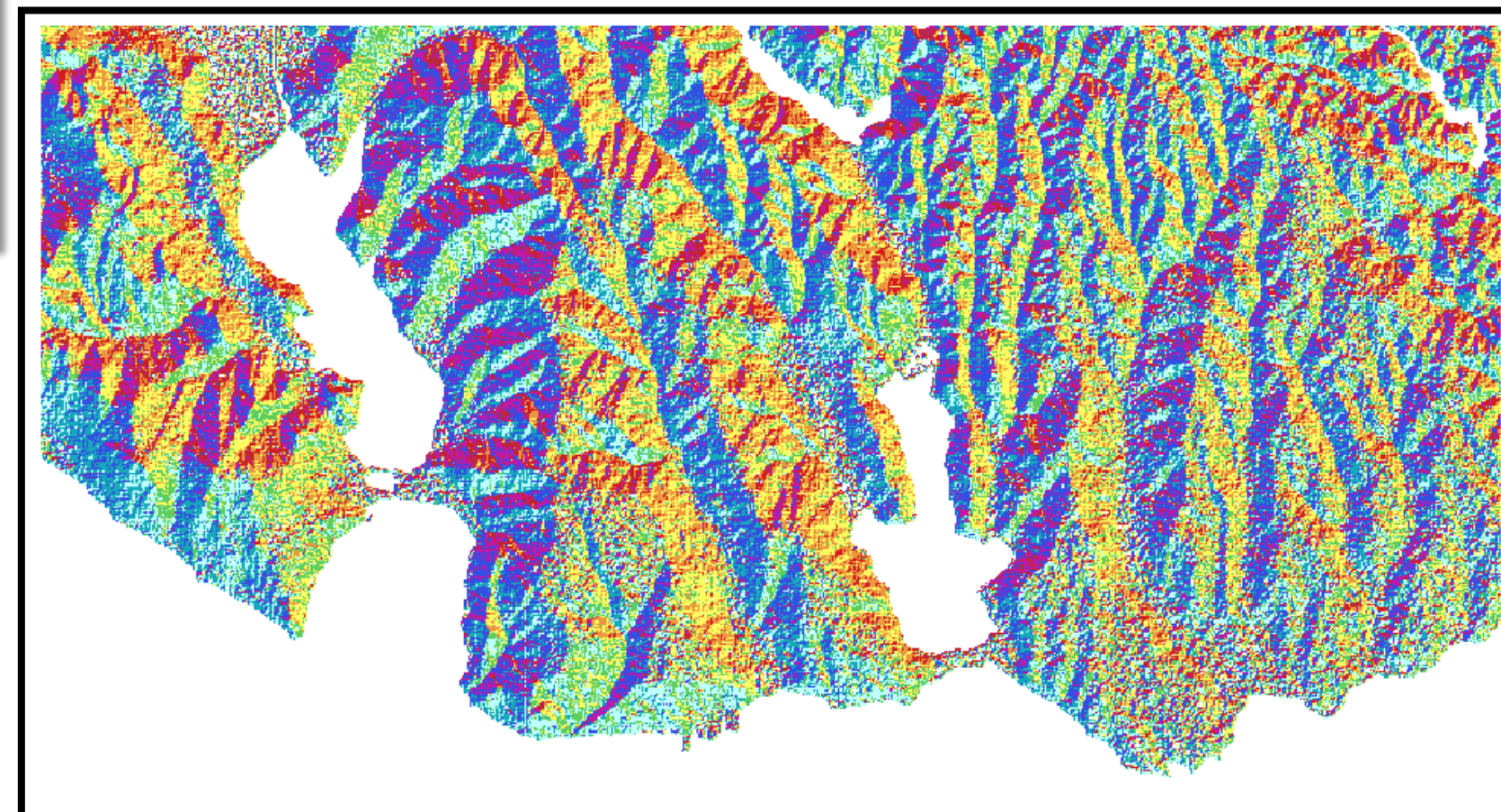


Value <=	Color	Label
22.5	[Red]	N
67.5	[Orange]	NE
112.5	[Yellow]	E
157.5	[Light Green]	SE
202.5	[Green]	S

Value <=	Color	Label
202.5	[Yellow]	S
247.5	[Light Green]	SW
292.5	[Green]	W
337.5	[Teal]	NW
360	[Blue]	N

Labeling

Value <=	Color	Label
202.5	[Cyan]	157.5 - 202.5
247.5	[Teal]	202.5 - 247.5
292.5	[Blue]	247.5 - 292.5
337.5	[Purple]	292.5 - 337.5
360	[Red]	337.5 - 360





# Extracting Water Bodies

**Raster Calculator**

Parameters Log

Expression

**Layers**

- aspect@1
- hillshade@1
- ist\_dem@1
- landuse@1
- slope@1
- water\_bod

**Operators**

+, \*, cos, sin, log10, AND, -, /, acos, asin, ln, OR, ^, sqrt, tan, atan, (, ), <, >, =, !=, <=, >=

**Expression**

"landuse@1" = 6

**Predefined expressions**

NDVI

Reference layer(s) (used for automated extent, cellsize, and CRS) [optional]

1 elements selected

Cell size (use 0 or empty to set it automatically) [optional]

0.000000

Output extent (xmin, xmax, ymin, ymax) [optional]

[Leave blank to use min covering extent]

Output CRS [optional]

Output

C:/Lecture/Lab2/process/water\_bodies.tif

☒ Open output file after running algorithm

0%

Run as Batch Process... Run Close Help

**Multiple selection**

☐ aspect []

☐ hillshade []

☐ ist\_dem []

☒ landuse []

☐ slope []

Select All

Clear Selection

Toggle Selection

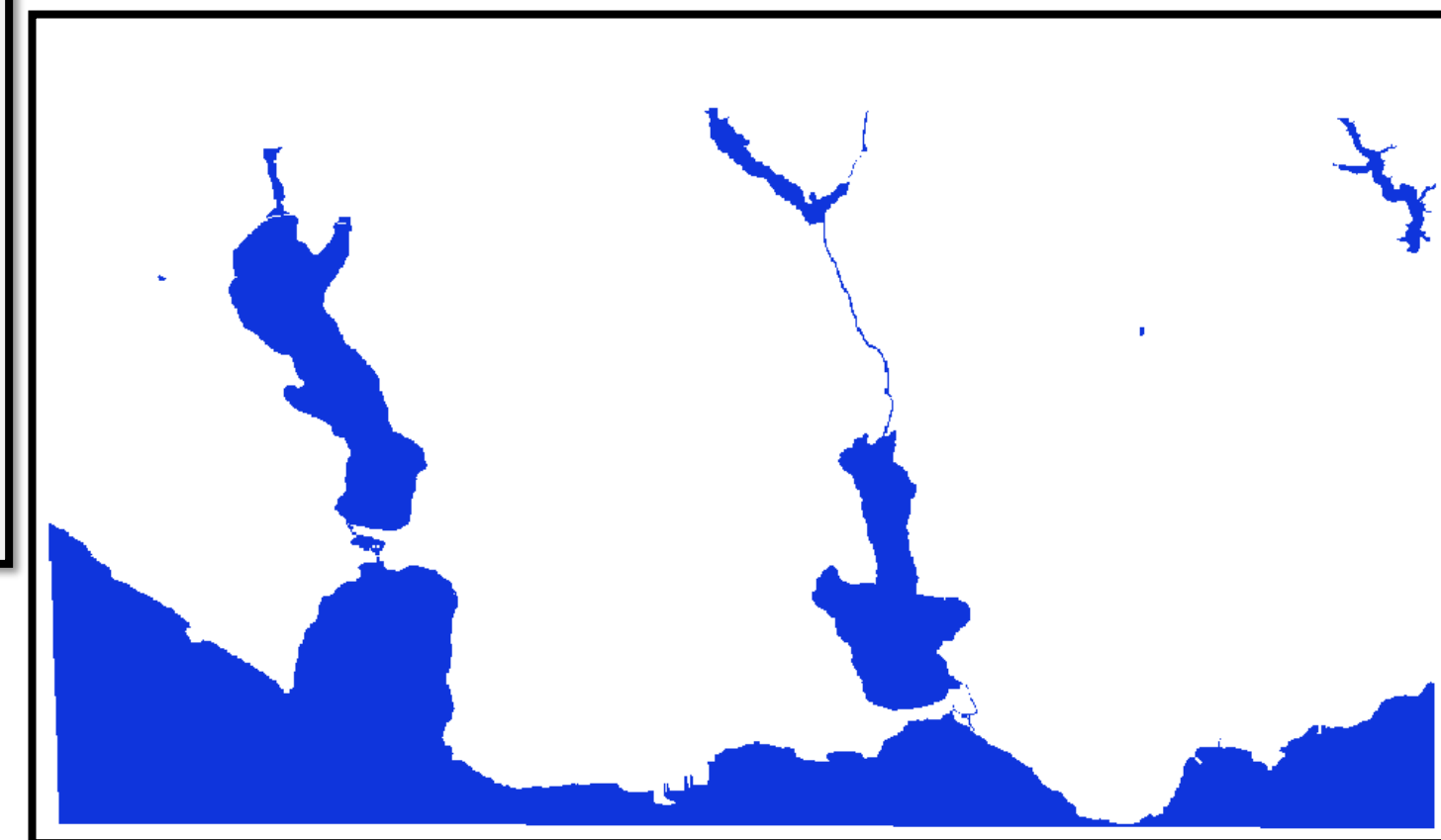
Add File(s)...

Add Directory...

OK

Cancel

Used for applying the extent, cellsize and CRS of a current layer



# Generating Proximity Raster

Proximity (Raster Distance)

Parameters Log

Input layer  
water\_bodies []

Band number  
Band 1 (Gray)

A list of pixel values in the source image to be considered target pixels [optional]  
[ ]

Distance units  
Georeferenced coordinates

The maximum distance to be generated [optional]  
0.000000

Value to be applied to all pixels that are within the -maxdist of target pixels [optional]  
0.000000

Nodata value to use for the destination proximity raster [optional]  
0.000000

► Advanced parameters

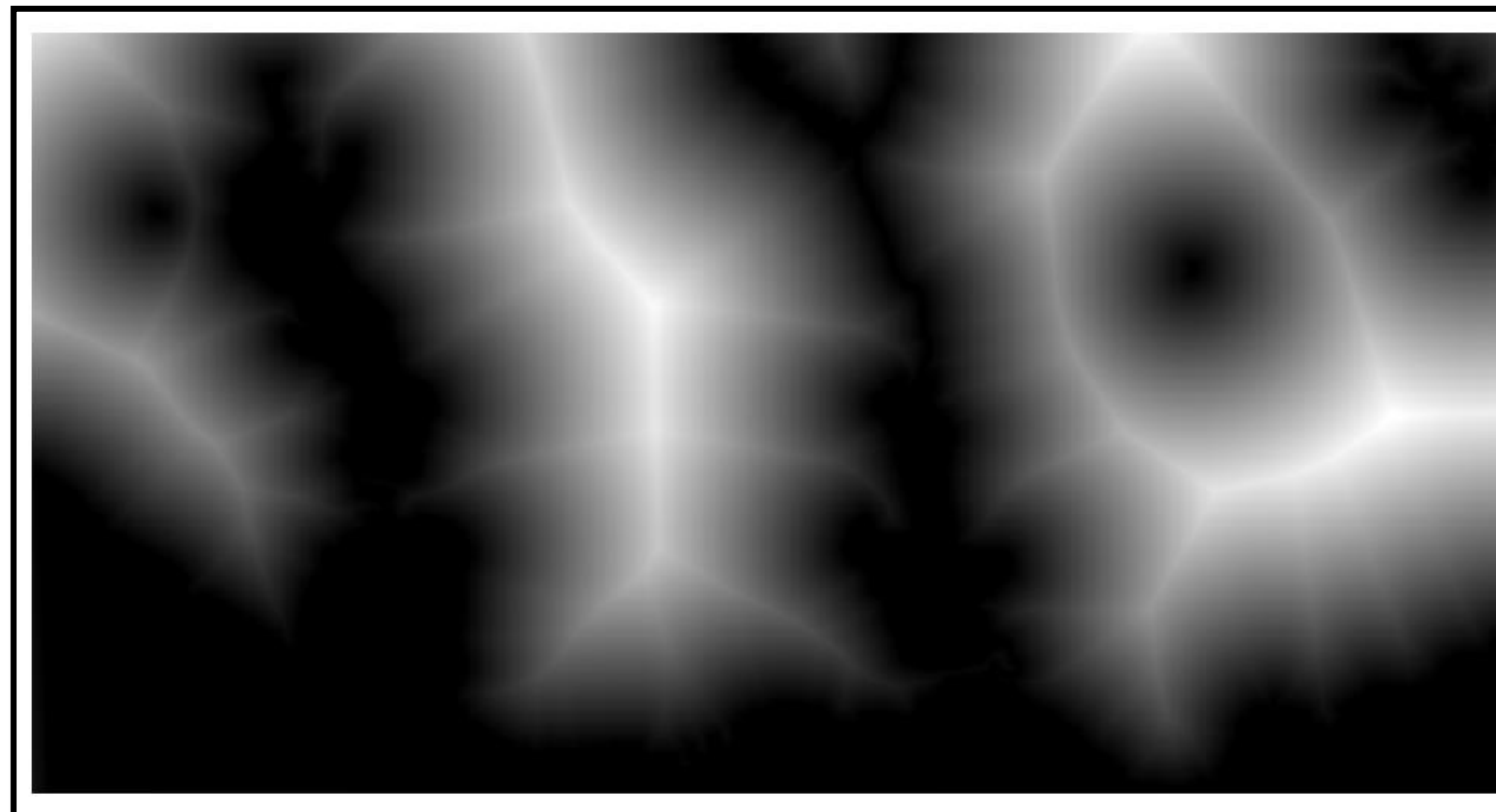
Proximity map  
C:/Lecture/Lab2/process/proximity.tif

☒ Open output file after running algorithm

GDAL/OGR console call  
python3 -m gdal\_proximity -srcband 1 -distunits GEO -nodata 0.0 -ot Float32 -of GTiff C:/Lecture/Lab2/process/water\_bodies.tif C:/Lecture/Lab2/process/proximity.tif

0%

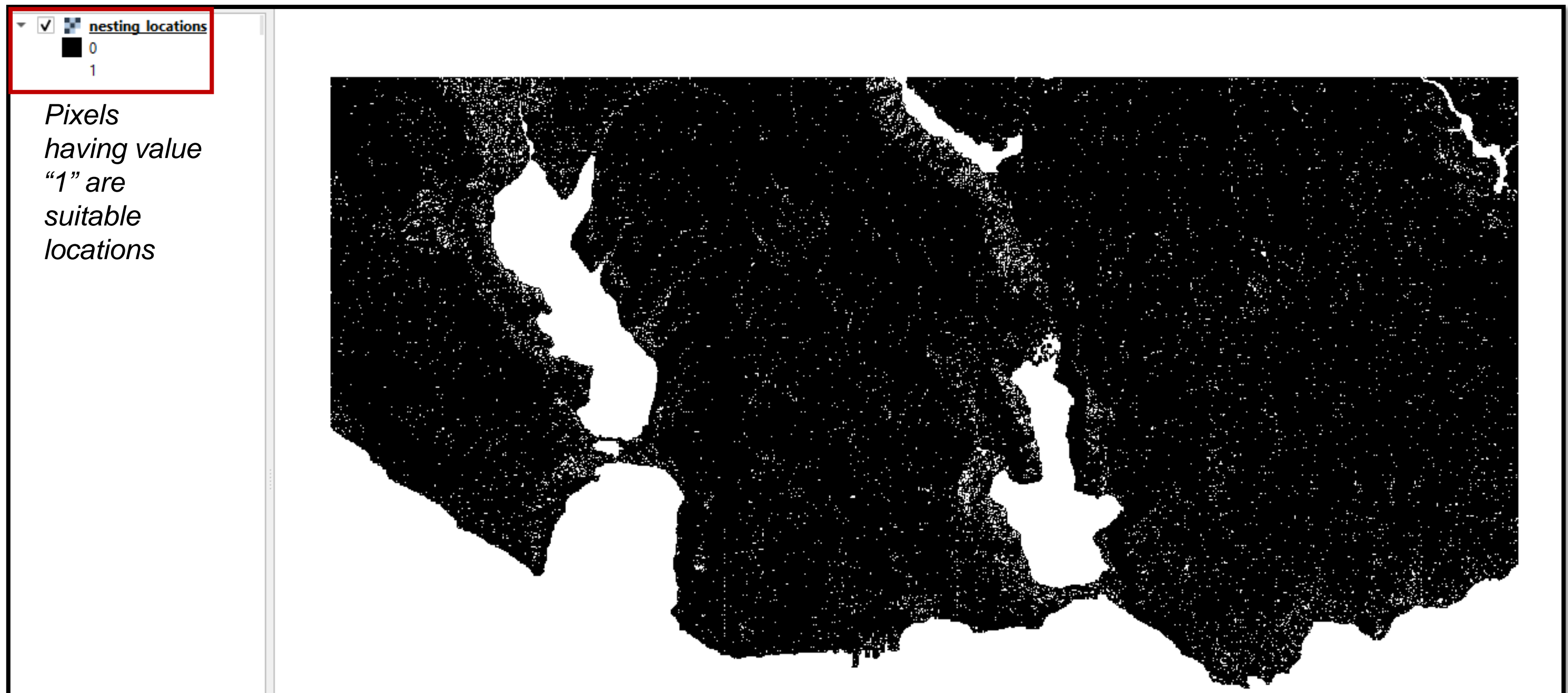
Run as Batch Process... Run Close Help



# Suitability Analysis

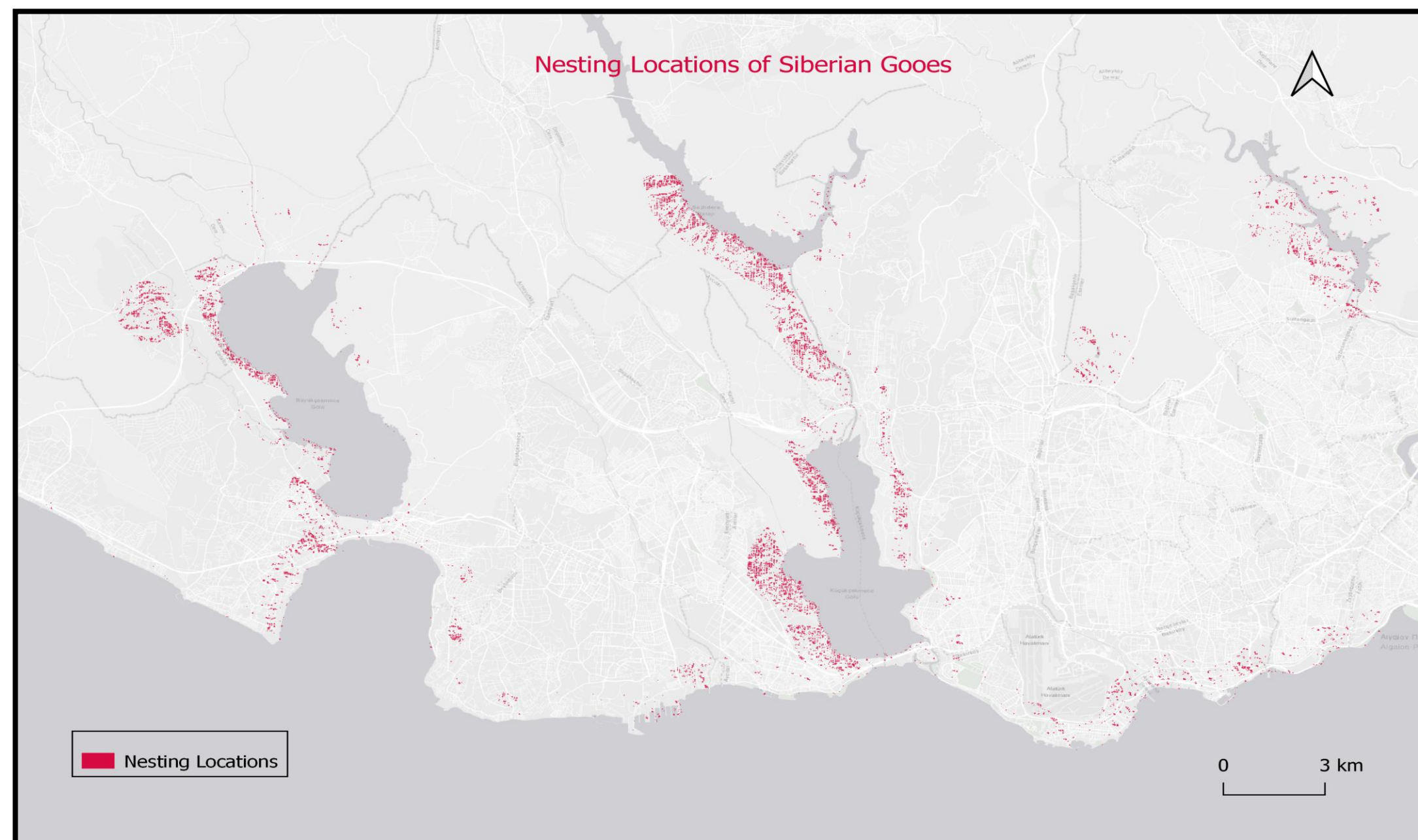
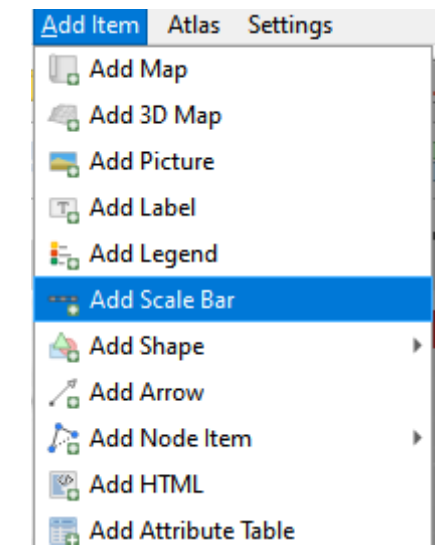
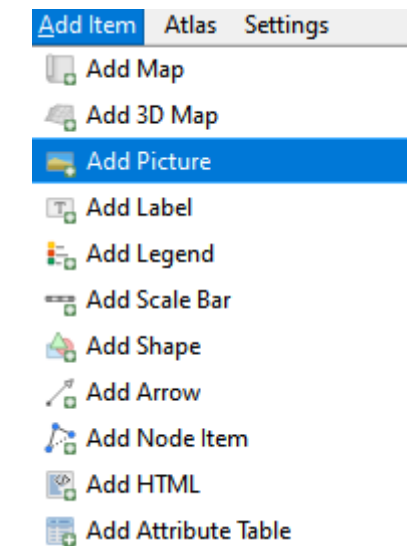
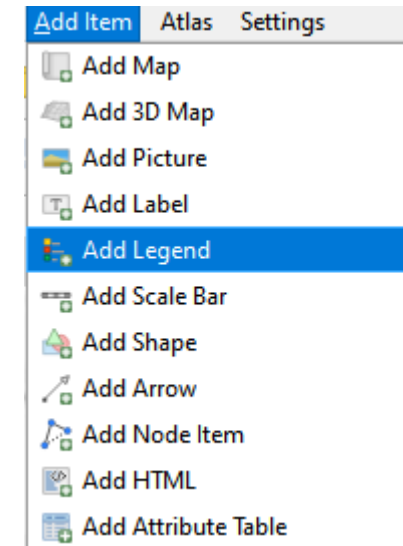
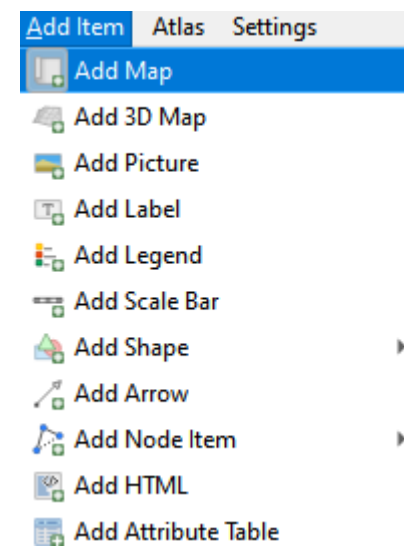
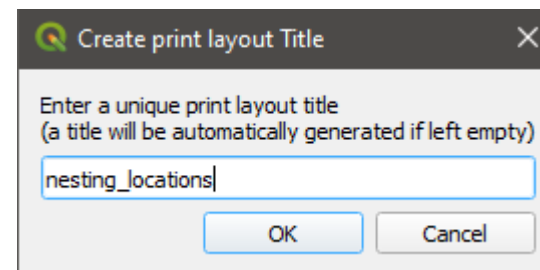
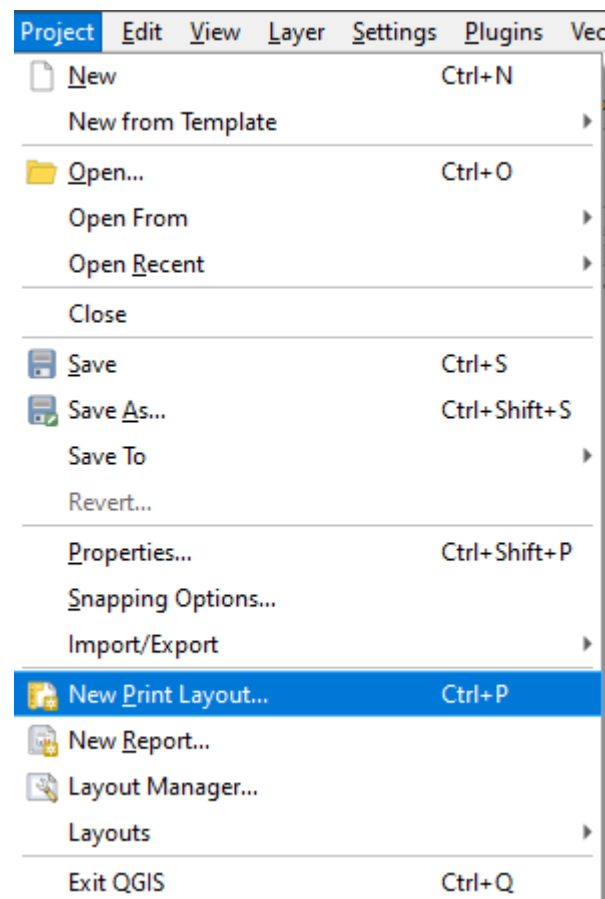
## Raster Calculator Parameters

*("aspect@1" > 22.5 AND "aspect@1" < 67.5) AND  
("proximity@1" < 1000) AND  
("slope@1" > 3 AND "slope@1" < 8.5)*





# Creating Final Map



# Results & Take Home

*Our aims were*

- *Find the available nesting locations of Siberian goose by considering the followings:*
  - *1000 km near the sea*
  - *Gentle or moderate slope areas*
  - *NE direction of aspect*

*Output Data:*

- *Nesting Locations (Raster/GeoTIFF)*

*Take Home Part*

- *Find areas that will be affected by a possible flood by using*
  - *350m distance from water bodies*
  - *Maximum 25m height*
  - *Having gentle or lower slope*





*Contact:*

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