World Organisation for Animal Health

GF-TADs Foot and Mouth Disease Risk Assessment Training Workshop

19 - 21 September 2023 Johannesburg, South Africa

agriculture, land reform & rural development

Department:
Agriculture, Land Reform and Rural Development
REPUBLIC OF SOUTH AFRICA

BMZ Federal Ministry for Economic Cooperation and Development

Hotspot determination - Interpolation

Practical – Heatmap (Kernel density estimation)

Software

Interpolation – Basics (points)

- Heatmap – kernel density estimation
  - The density is calculated based on the number of points in a location, with larger numbers of clustered points resulting in larger values
  - Heatmaps allow easy identification of hotspots and clustering of points
- IDW (Inverse Distance Weighted) interpolation
  - Sample points are weighted during interpolation such that the influence of one point relative to another declines with distance from the unknown point you want to create.
- TIN (Triangulated Irregular Network) interpolation
  - create a surface formed by triangles of nearest neighbour points

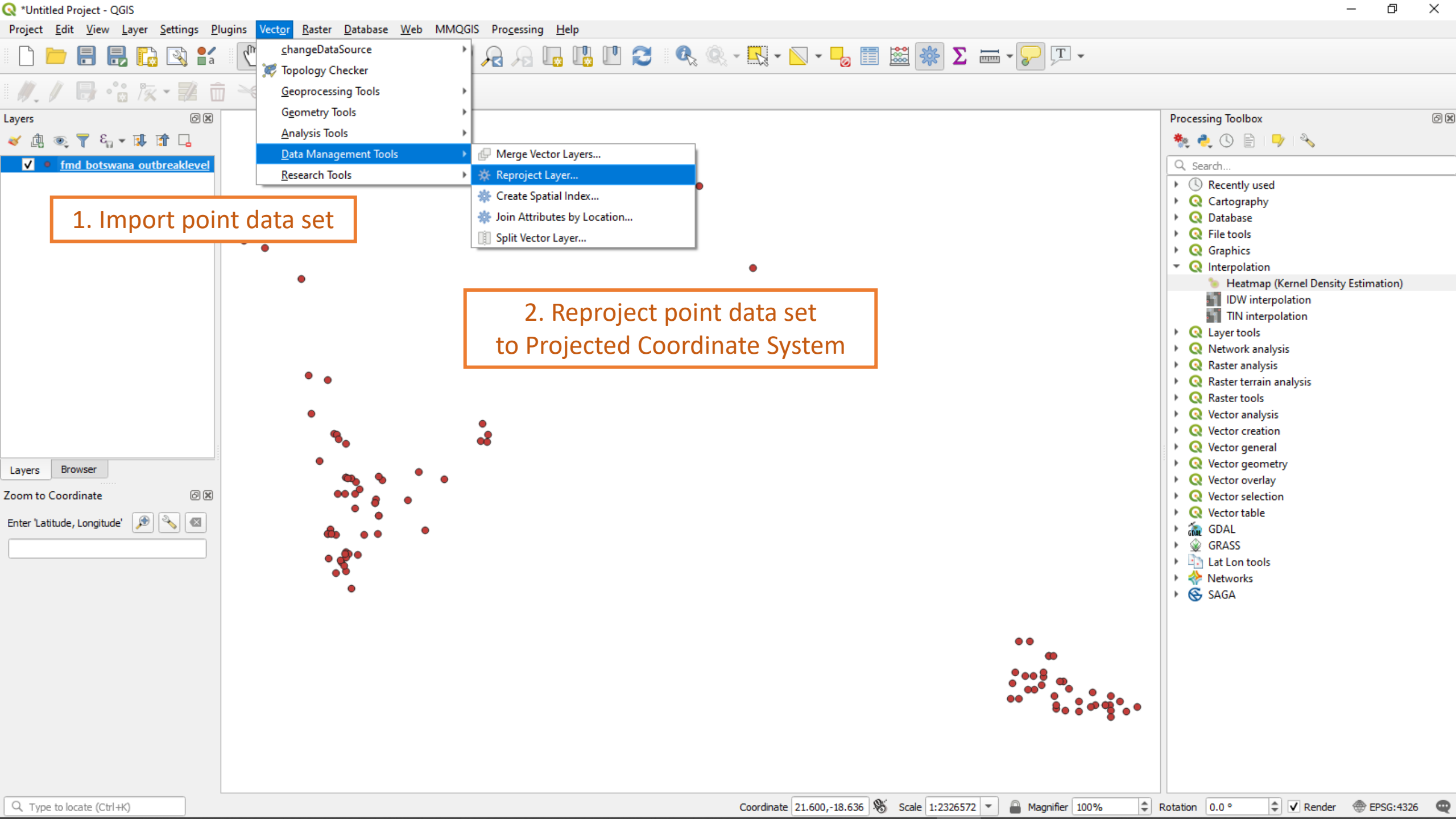
Heatmap – kernel density estimation

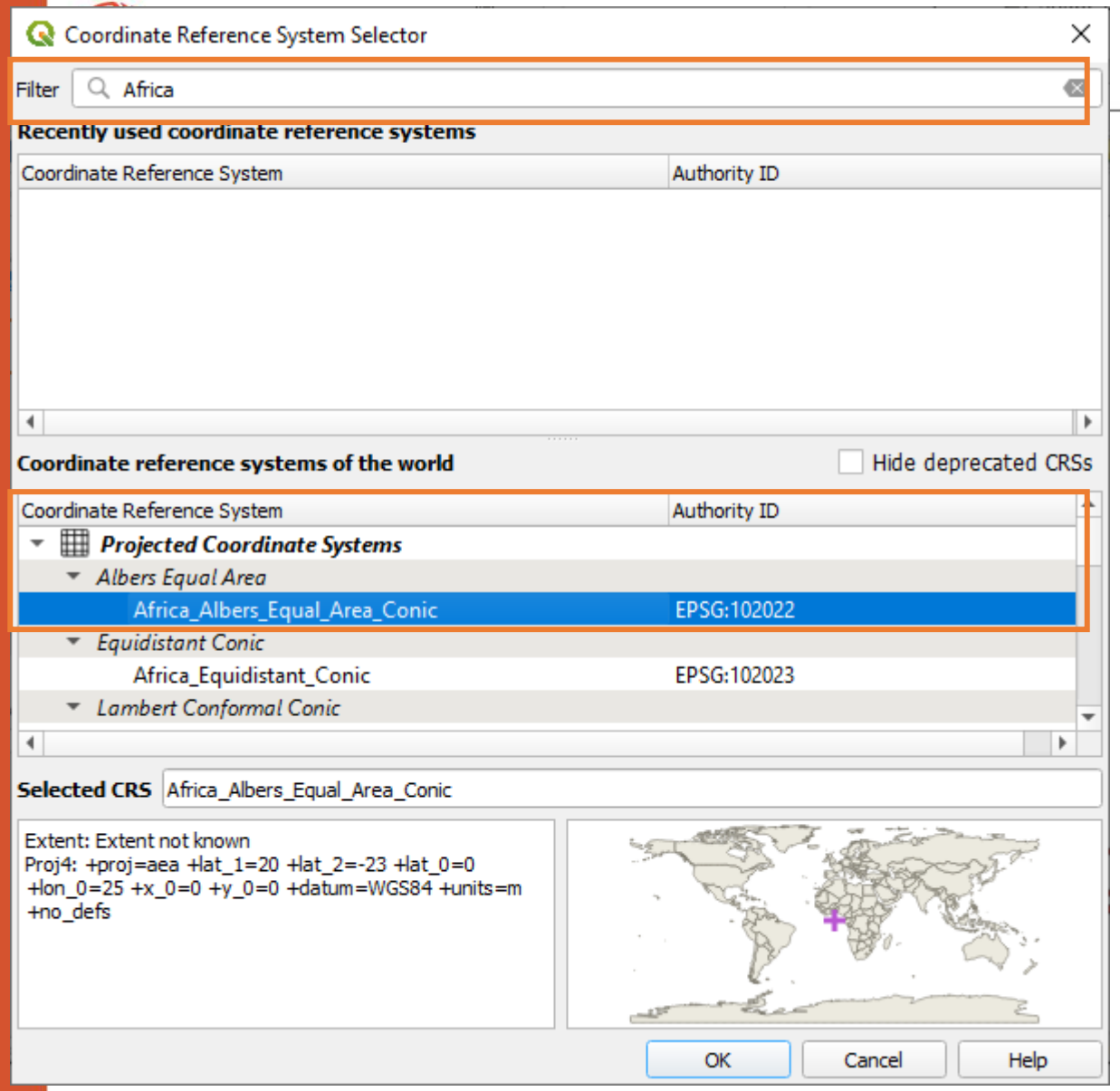
For

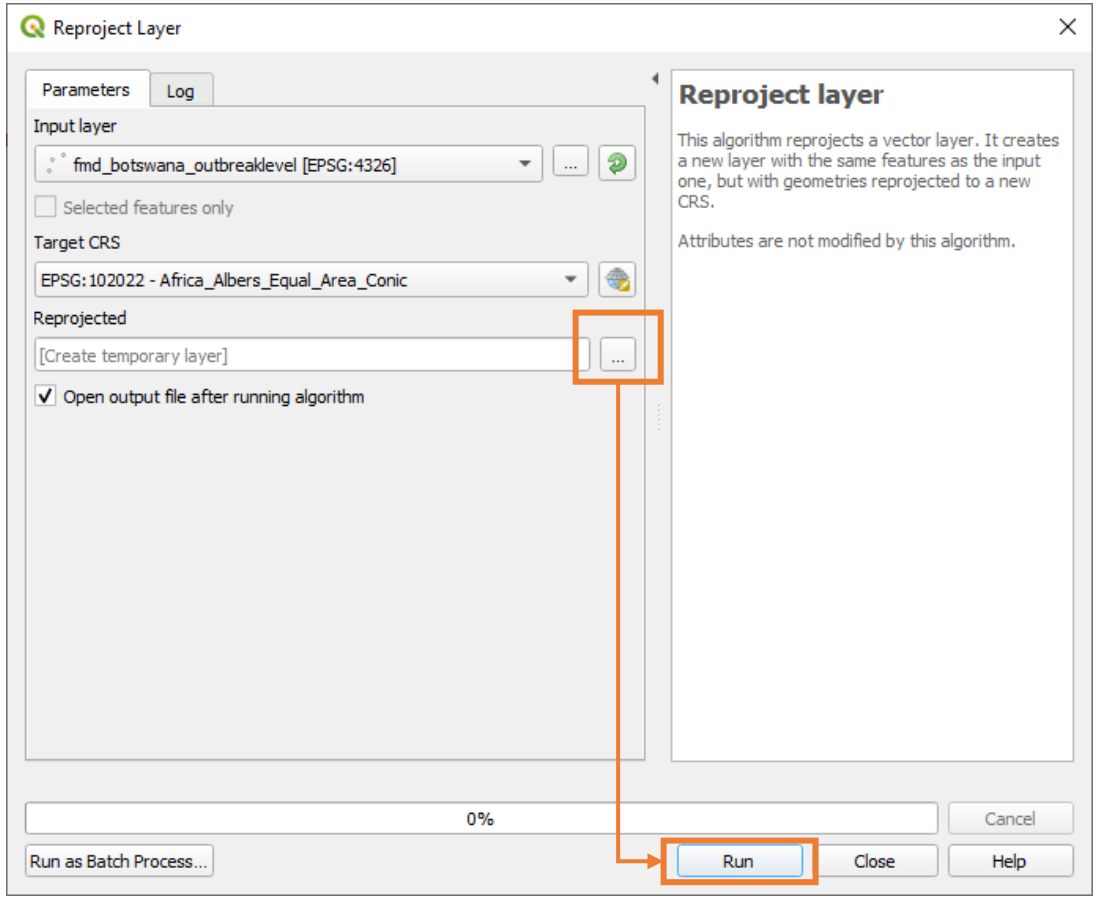
- Visual clarity
- Flexible
- Non-parametric
- Useful for preliminary analysis

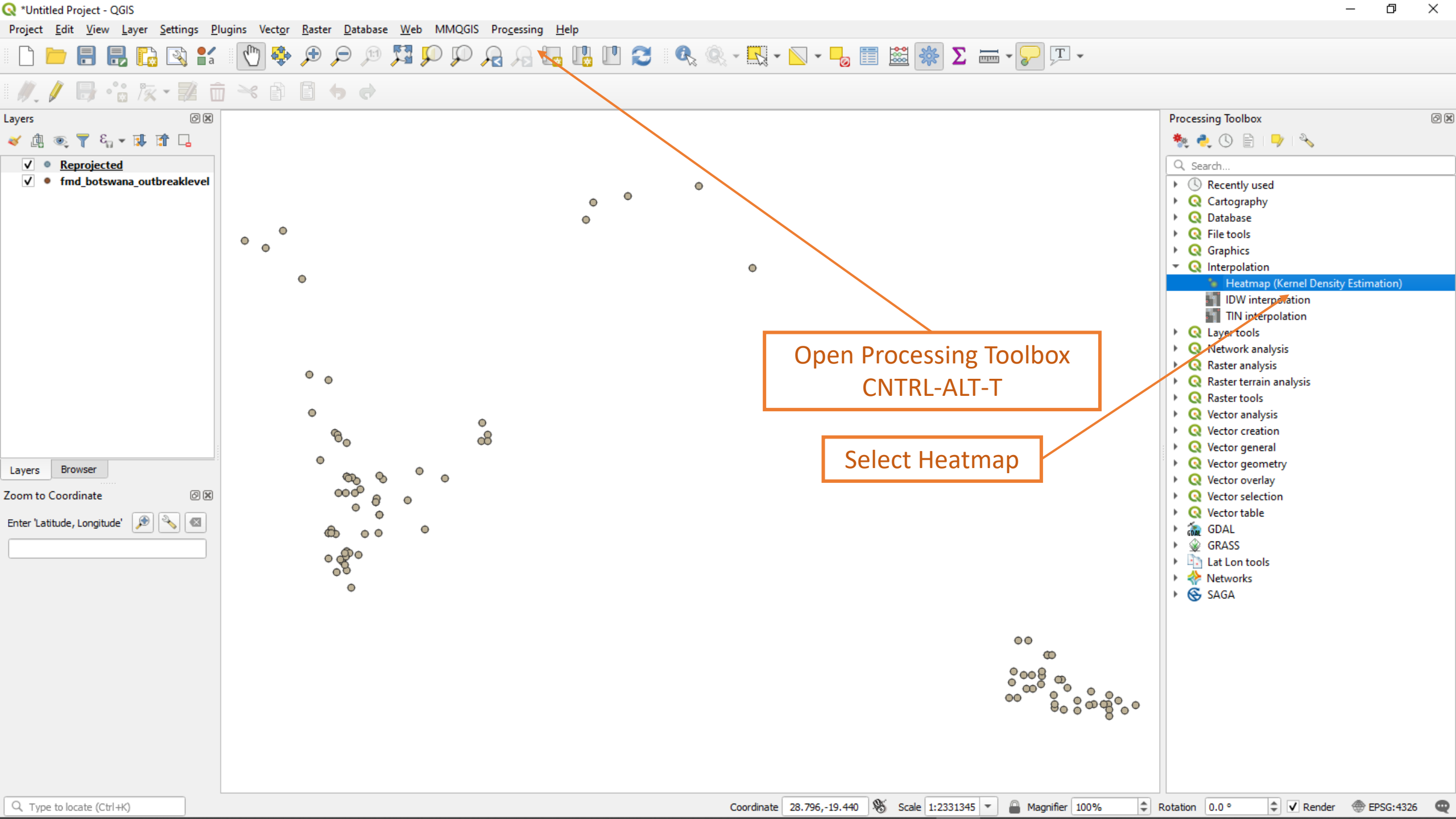
Against

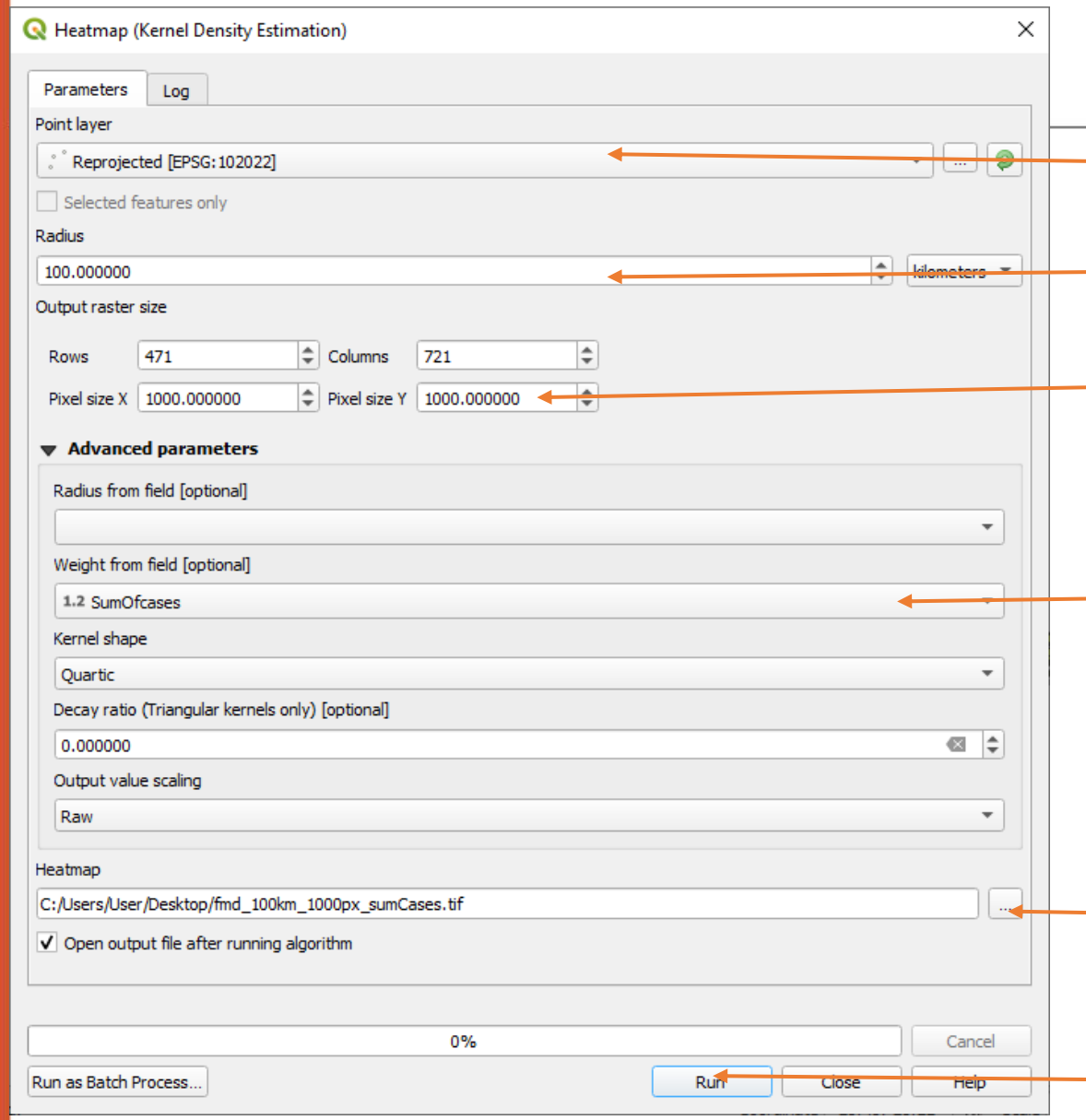
- Choice of bandwidth
- Computational intensity
- Edge effects


*Untitled Project - QGIS
Project Edit View Layer Settings Plugins Vector Raster Database Web MMQGIS Processing Help
changeDataSource
Topology Checker
Geoprocessing Tools
Geometry Tools
Analysis Tools
Data Management Tools
Research Tools
Merge Vector Layers...
Reproject Layer...
Create Spatial Index...
Join Attributes by Location...
Split Vector Layer...
Layers
fmd_botswana_outbreaklevel
1. Import point data set
2. Reproject point data set
to Projected Coordinate System
Layers Browser
Zoom to Coordinate
Enter 'Latitude, Longitude'
Processing Toolbox
Search...
Recently used
Cartography
Database
File tools
Graphics
Interpolation
Heatmap (Kernel Density Estimation)
IDW interpolation
TIN interpolation
Layer tools
Network analysis
Raster analysis
Raster terrain analysis
Raster tools
Vector analysis
Vector creation
Vector general
Vector geometry
Vector overlay
Vector selection
Vector table
GDAL
GRASS
Lat Lon tools
Networks
SAGA
Type to locate (Ctrl+K)
Coordinate 21.600,-18.636
Scale 1:2326572
Magnifier 100%
Rotation 0.0 °
Render
EPSG:4326


Coordinate Reference System Selector
Filter
Africa
Recently used coordinate reference systems
Coordinate Reference System
Authority ID
Coordinate reference systems of the world
Hide deprecated CRSs
Coordinate Reference System
Authority ID
Projected Coordinate Systems
Albers Equal Area
Africa_Albers_Equal_Area_Conic
EPSG:102022
Equidistant Conic
Africa_Equidistant_Conic
EPSG:102023
Lambert Conformal Conic
Selected CRS
Africa_Albers_Equal_Area_Conic
Extent: Extent not known
Proj4: +proj=aea +lat_1=20 +lat_2=-23 +lat_0=0 +lon_0=25 +x_0=0 +y_0=0 +datum=WGS84 +units=m +no_defs
OK
Cancel
Help


Reproject Layer
Parameters
Log
Input layer
fmd_botswana_outbreaklevel [EPSG:4326]
Selected features only
Target CRS
EPSG:102022 - Africa_Albers_Equal_Area_Conic
Reprojected
[Create temporary layer]
Open output file after running algorithm
Reproject layer
This algorithm reprojects a vector layer. It creates a new layer with the same features as the input one, but with geometries reprojected to a new CRS.
Attributes are not modified by this algorithm.
0%
Cancel
Run as Batch Process...
Run
Close
Help


*Untitled Project - QGIS
Project Edit View Layer Settings Plugins Vector Raster Database Web MMQGIS Processing Help
Layers
Reprojected
fmd_botswana_outbreaklevel
Layers Browser
Zoom to Coordinate
Enter 'Latitude, Longitude'
Open Processing Toolbox
CNTRL-ALT-T
Select Heatmap
Processing Toolbox
Search...
Recently used
Cartography
Database
File tools
Graphics
Interpolation
Heatmap (Kernel Density Estimation)
IDW interpolation
TIN interpolation
Layer tools
Network analysis
Raster analysis
Raster terrain analysis
Raster tools
Vector analysis
Vector creation
Vector general
Vector geometry
Vector overlay
Vector selection
Vector table
GDAL
GRASS
Lat Lon tools
Networks
SAGA
Type to locate (Ctrl+K)
Coordinate 28.796,-19.440
Scale 1:2331345
Magnifier 100%
Rotation 0.0 °
Render
EPSG:4326



1. Make sure to choose the correct input layer

2. Set the search radius to 100km

3. Set the pixel size to 1000 (m)

4. Select a weighting variable if applicable

5. Create a raster output file on desktop or folder of your choice

6. RUN

*Untitled Project - QGIS

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

Layers

Heatmap
2.86044e-09
2186.64
Reprojected
fmd_botswana_outbreaklevel

Layers Browser

Statistics

fmd_botswana_outbreaklevel

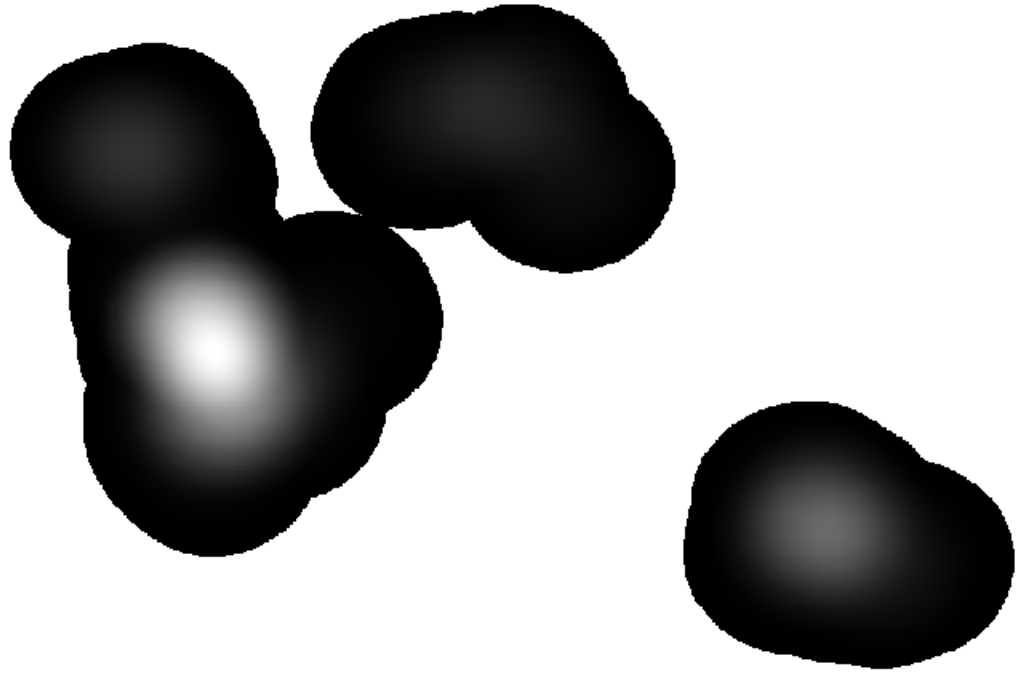
Statistic Value

Selected features only

Zoom to Coordinate

Enter 'Latitude, Longitude'

Try make it look more appealing
Double click on the Raster layer (Heatmap)



Processing Toolbox

Search...

Recently used
Cartography
Database
File tools
Graphics
Interpolation
Heatmap (Kernel Density Estimation)
IDW interpolation
TIN interpolation
Raster terrain analysis
Raster tools
Vector analysis
Vector creation
Vector general
Vector geometry

Heatmap (Kernel Density Estimation)

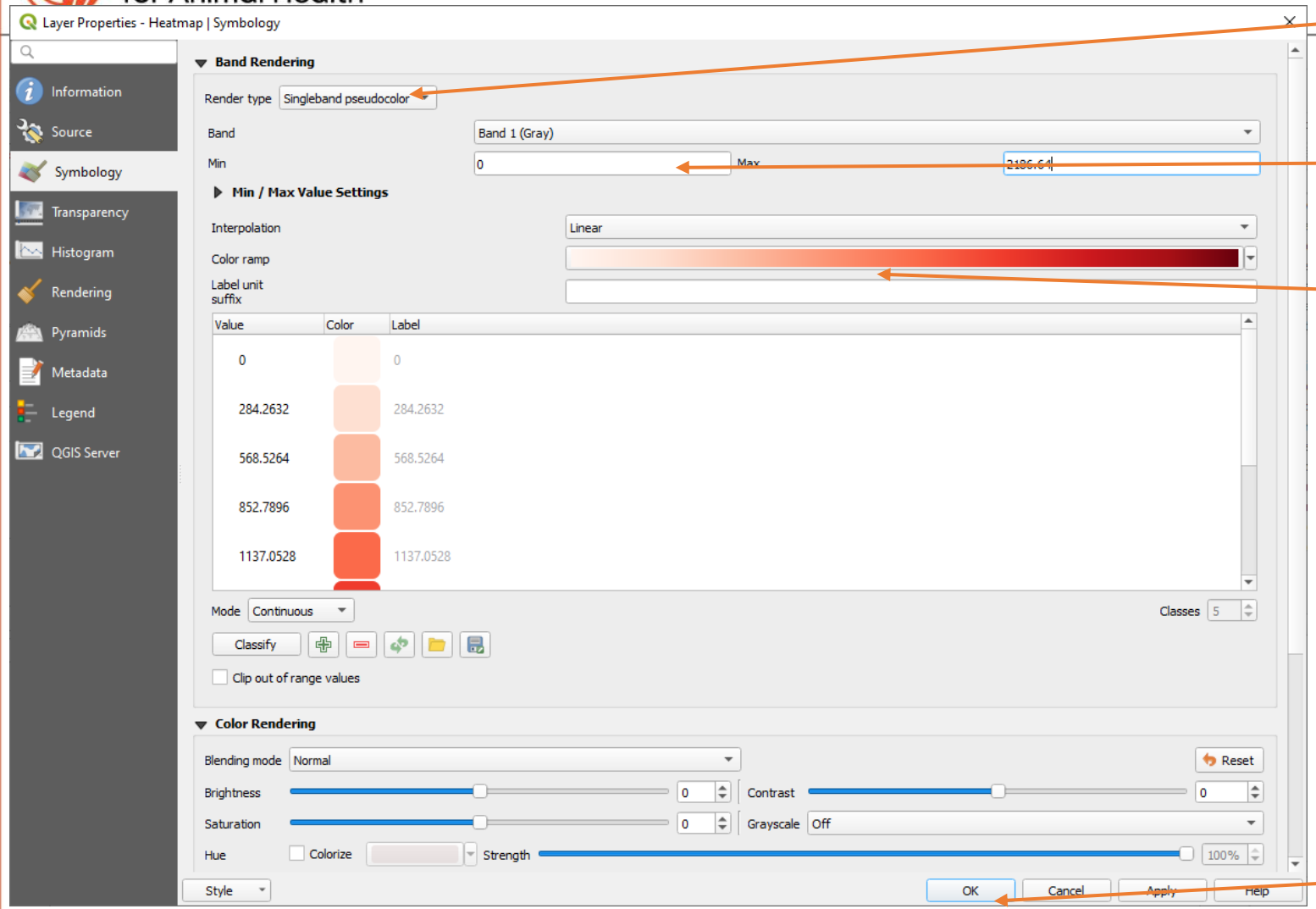
Algorithm ID:
'qgis:heatmapkerneldensityestimation'

Identify Results

Feature Value

Mode Current layer
Auto open form
View Tree
Help

Type to locate (Ctrl+K)
4 legend entries removed.
Coordinate 28.45,-17.19
Scale 1:4621891
Magnifier 100%
Rotation 0.0 °
Render
EPSG:4326

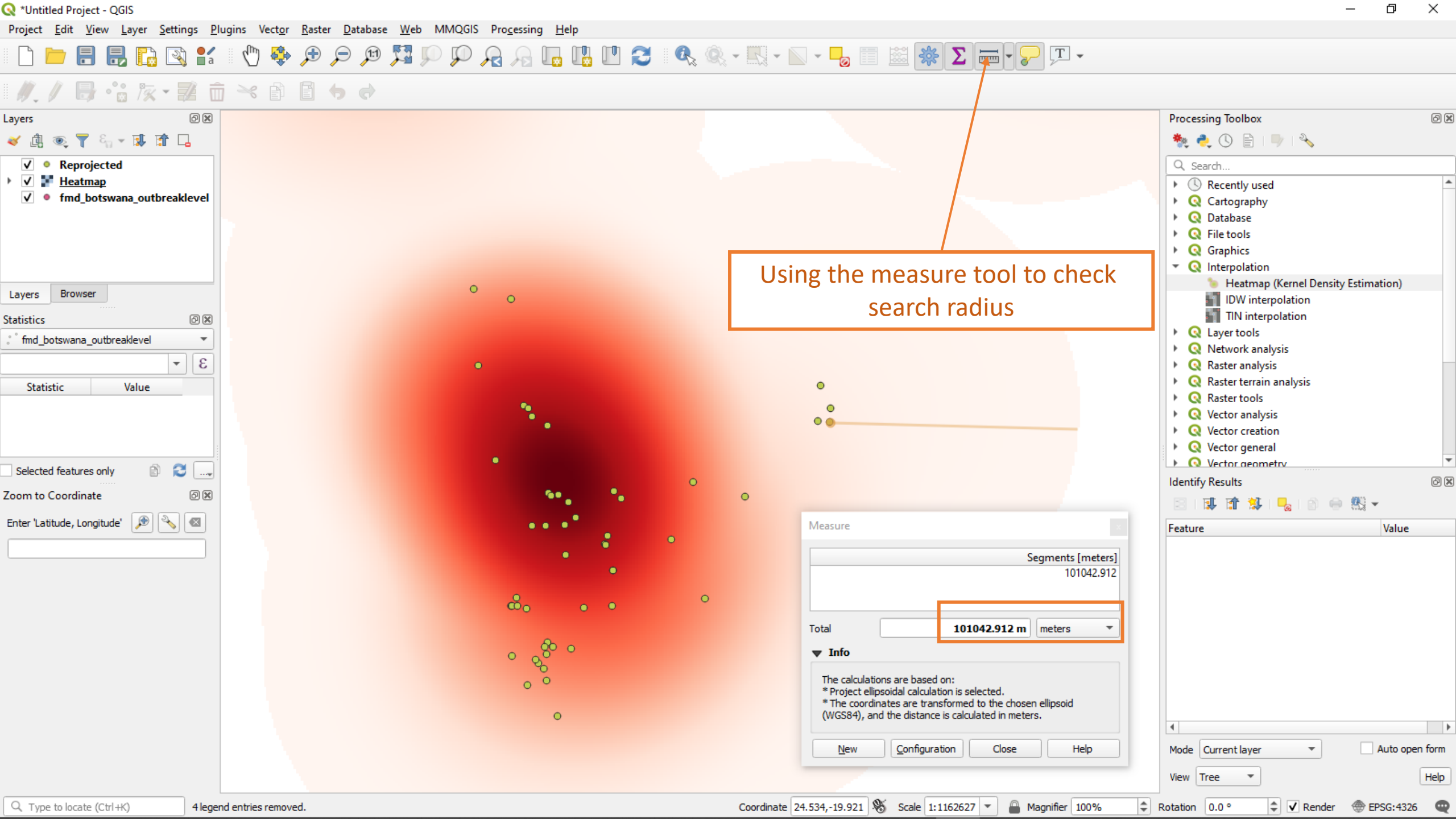


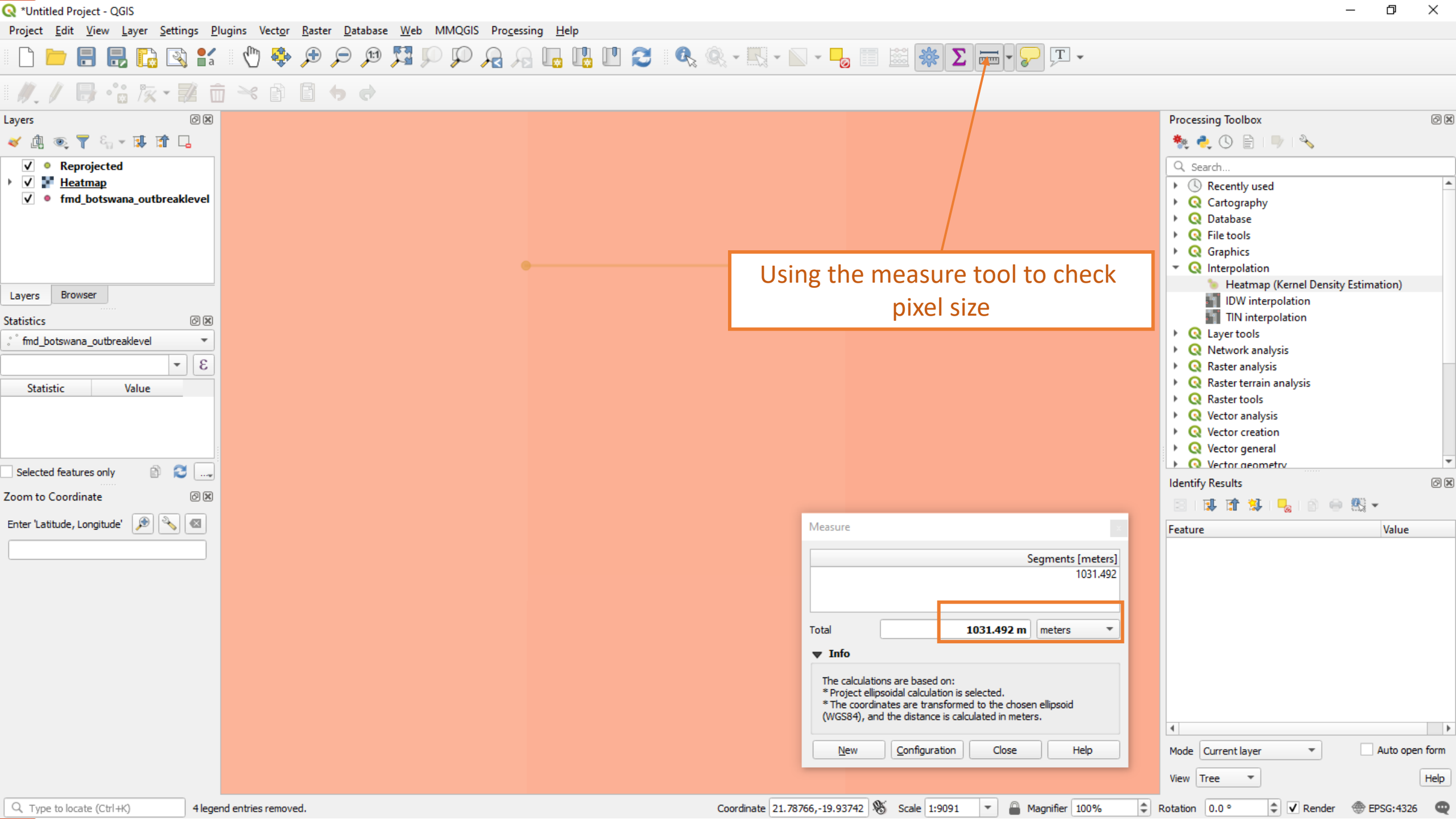
1. Change render type to Singleband pseudocolor

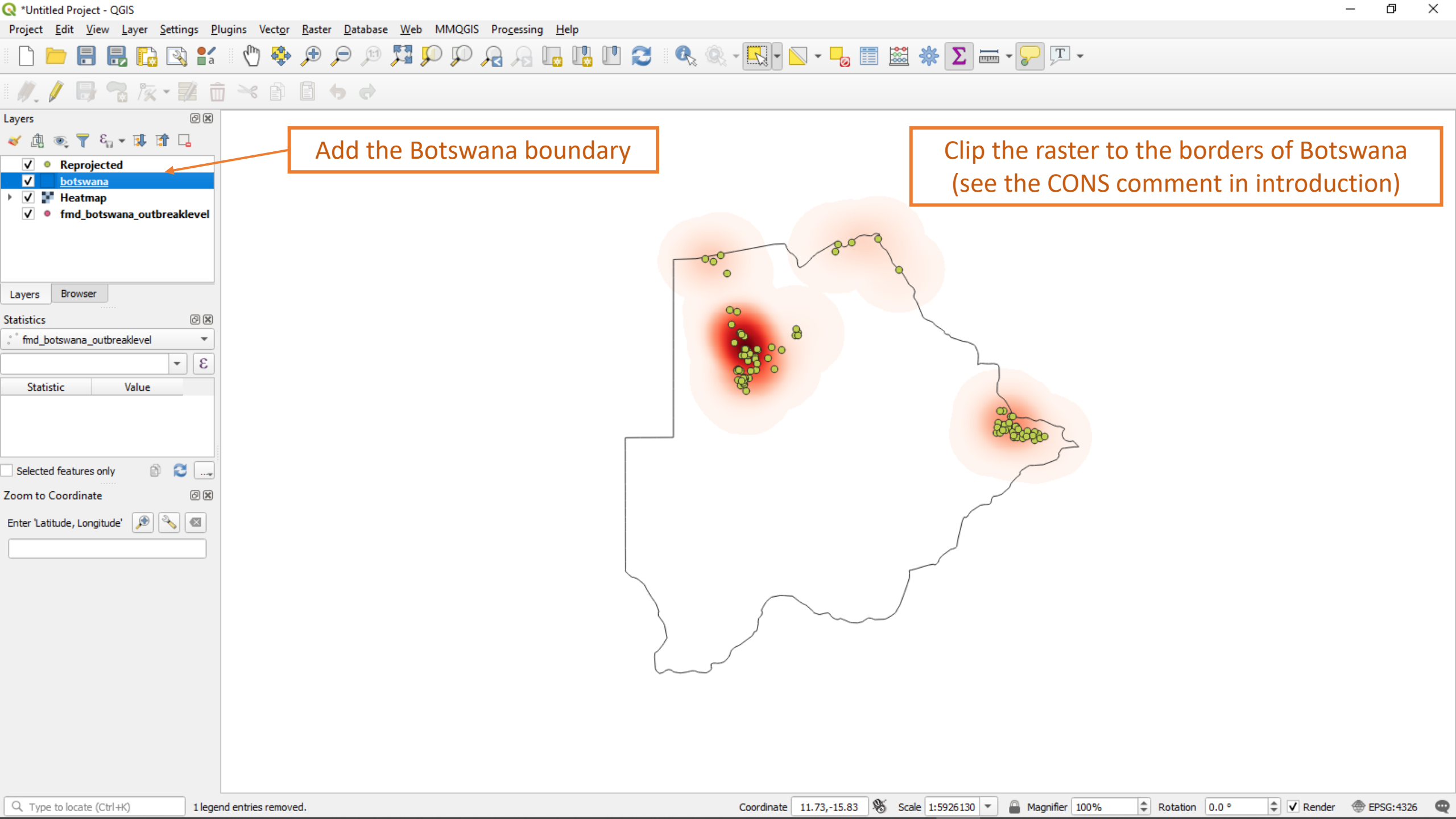
2. Set minimum to Zero

3. Reds (or Blues) is a commonly used gradient

4. OK


*Untitled Project - QGIS
Project Edit View Layer Settings Plugins Vector Raster Database Web MMQGIS Processing Help
Layers
Reprojected
Heatmap
fmd_botswana_outbreaklevel
Layers Browser
Statistics
fmd_botswana_outbreaklevel
Statistic Value
Selected features only
Zoom to Coordinate
Enter 'Latitude, Longitude'
Using the measure tool to check search radius
Measure
Segments [meters]
101042.912
Total
101042.912 m
meters
Info
The calculations are based on:
* Project ellipsoidal calculation is selected.
* The coordinates are transformed to the chosen ellipsoid (WGS84), and the distance is calculated in meters.
New Configuration Close Help
Processing Toolbox
Search...
Recently used
Cartography
Database
File tools
Graphics
Interpolation
Heatmap (Kernel Density Estimation)
IDW interpolation
TIN interpolation
Layer tools
Network analysis
Raster analysis
Raster terrain analysis
Raster tools
Vector analysis
Vector creation
Vector general
Vector geometry
Identify Results
Feature Value
Mode Current layer
Auto open form
View Tree
Help
Type to locate (Ctrl+K)
4 legend entries removed.
Coordinate 24.534,-19.921
Scale 1:1162627
Magnifier 100%
Rotation 0.0 °
Render
EPSG:4326


*Untitled Project - QGIS
Project Edit View Layer Settings Plugins Vector Raster Database Web MMQGIS Processing Help
Layers
Reprojected
Heatmap
fmd_botswana_outbreaklevel
Layers Browser
Statistics
fmd_botswana_outbreaklevel
Statistic Value
Selected features only
Zoom to Coordinate
Enter 'Latitude, Longitude'
Using the measure tool to check pixel size
Measure
Segments [meters]
1031.492
Total
1031.492 m
meters
Info
The calculations are based on:
* Project ellipsoidal calculation is selected.
* The coordinates are transformed to the chosen ellipsoid (WGS84), and the distance is calculated in meters.
New Configuration Close Help
Processing Toolbox
Search...
Recently used
Cartography
Database
File tools
Graphics
Interpolation
Heatmap (Kernel Density Estimation)
IDW interpolation
TIN interpolation
Layer tools
Network analysis
Raster analysis
Raster terrain analysis
Raster tools
Vector analysis
Vector creation
Vector general
Vector geometry
Identify Results
Feature Value
Mode Current layer
Auto open form
View Tree
Help
Type to locate (Ctrl+K)
4 legend entries removed.
Coordinate 21.78766,-19.93742
Scale 1:9091
Magnifier 100%
Rotation 0.0 °
Render
EPSG:4326


*Untitled Project - QGIS
Project Edit View Layer Settings Plugins Vector Raster Database Web MMQGIS Processing Help
Layers
Reprojected
botswana
Heatmap
fmd_botswana_outbreaklevel
Layers Browser
Statistics
fmd_botswana_outbreaklevel
Statistic Value
Selected features only
Zoom to Coordinate
Enter 'Latitude, Longitude'
Add the Botswana boundary
Clip the raster to the borders of Botswana
(see the CONS comment in introduction)
Type to locate (Ctrl+K)
1 legend entries removed.
Coordinate 11.73,-15.83
Scale 1:5926130
Magnifier 100%
Rotation 0.0 °
Render
EPSG:4326

*Untitled Project - QGIS

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

Raster Calculator...
Align Rasters...
Georeferencer...
Analysis
Projections
Miscellaneous
Extraction
Conversion

Clip Raster by Extent...
Clip Raster by Mask Layer...
Contour...

Use the Clip raster by Mask layer tool

Layers

Reprojected
botswana
Heatmap
fmd_botswana_outbreaklevel

Layers Browser

Statistics

fmd_botswana_outbreaklevel

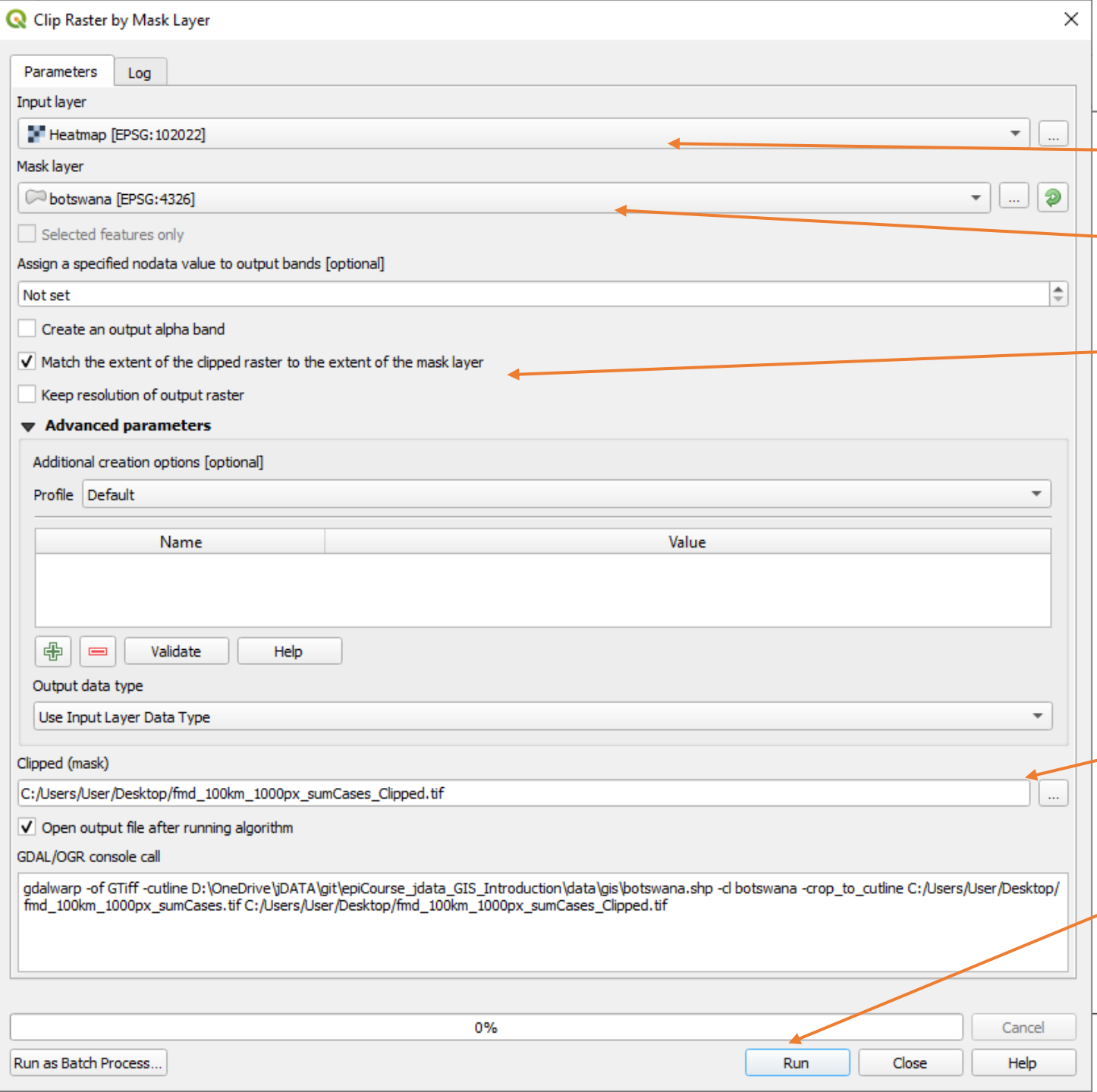
Statistic Value

Selected features only

Zoom to Coordinate

Enter 'Latitude, Longitude'

Type to locate (Ctrl+K) 1 legend entries removed. Coordinate 20.29,-15.28 Scale 1:5926130 Magnifier 100% Rotation 0.0 ° Render EPSG:4326



1. Make sure to choose the correct input layer

2. Set the masking vector

3. Set the extent of the raster

4. Create a raster output file on desktop or folder of your choice

5. RUN

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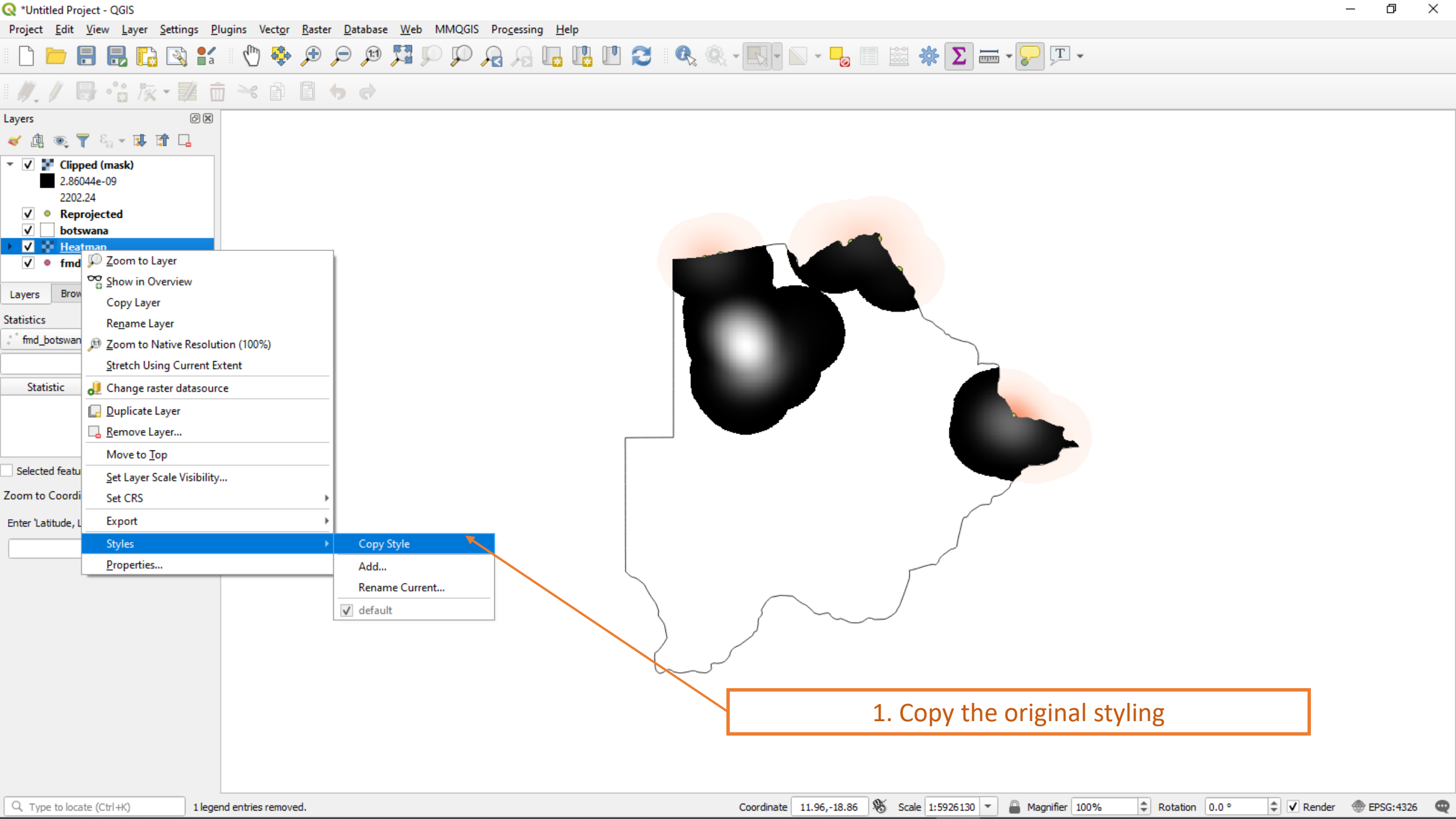
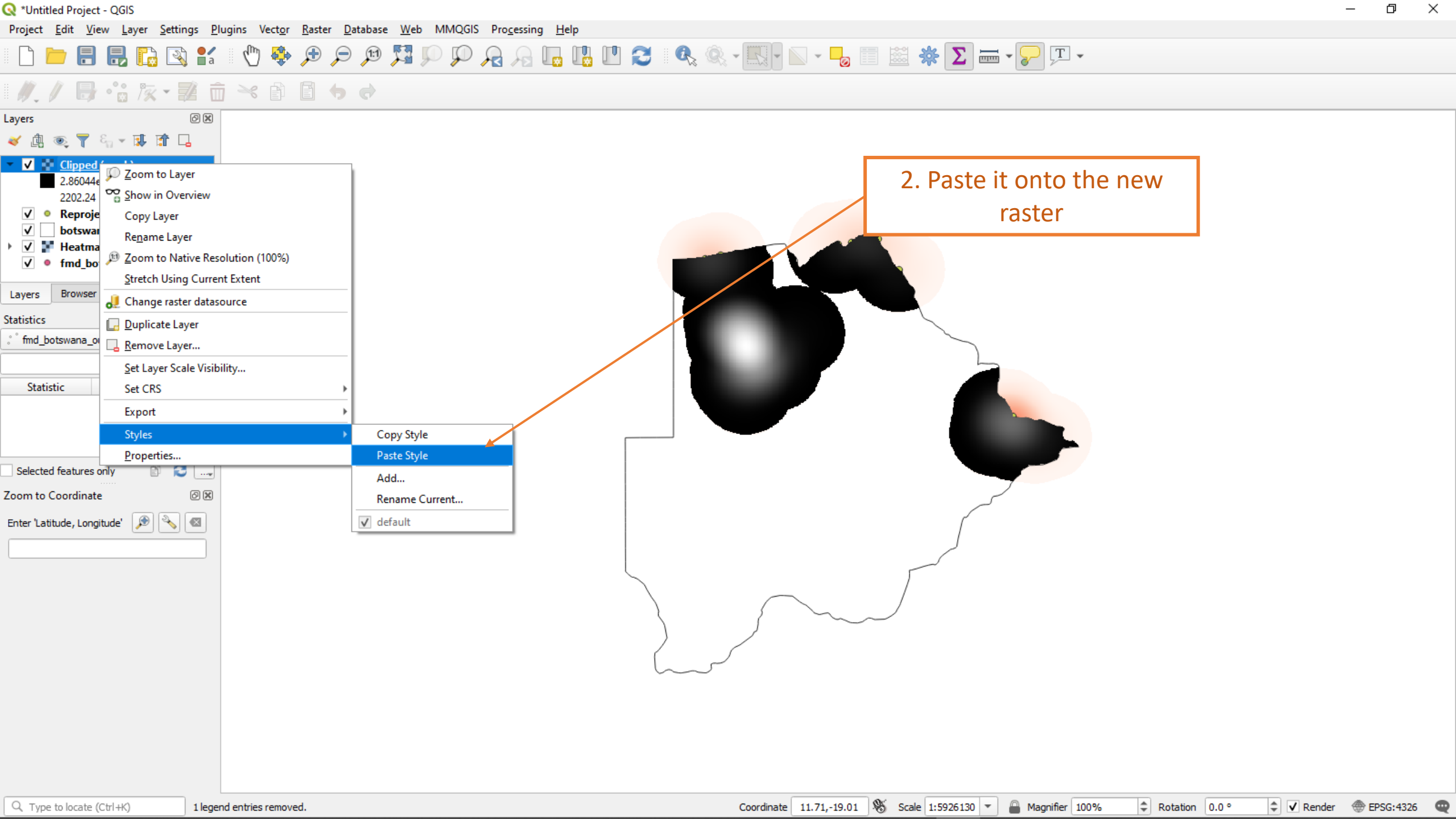
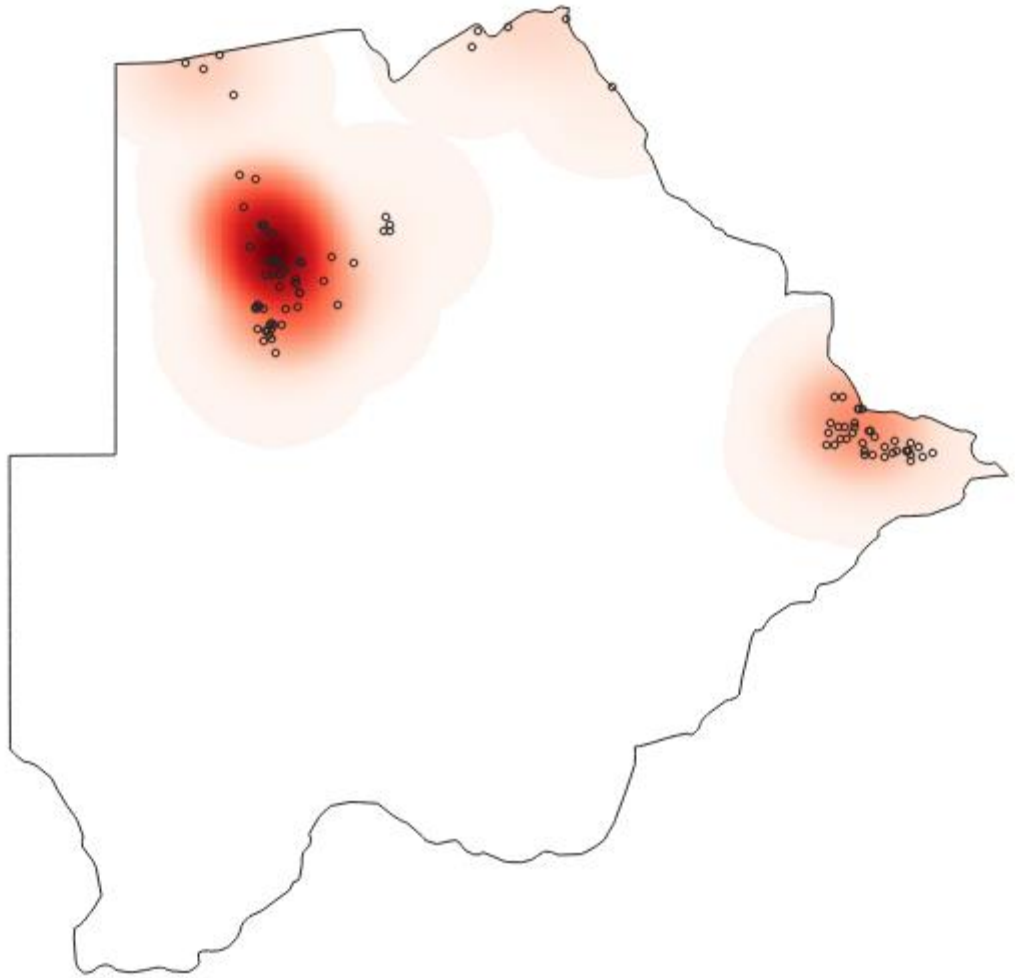

*Untitled Project - QGIS
Project Edit View Layer Settings Plugins Vector Raster Database Web MMQGIS Processing Help
Layers
Clipped (mask)
2.86044e-09
2202.24
Reprojected
botswana
Heatmap
fmd
Zoom to Layer
Show in Overview
Copy Layer
Rename Layer
Zoom to Native Resolution (100%)
Stretch Using Current Extent
Change raster datasource
Duplicate Layer
Remove Layer...
Move to Top
Set Layer Scale Visibility...
Set CRS
Export
Styles
Properties...
Copy Style
Add...
Rename Current...
default
1. Copy the original styling
1 legend entries removed.
Coordinate 11.96,-18.86
Scale 1:5926130
Magnifier 100%
Rotation 0.0 °
Render
EPSG:4326


*Untitled Project - QGIS
Project Edit View Layer Settings Plugins Vector Raster Database Web MMQGIS Processing Help
Layers
Clipped
Zoom to Layer
Show in Overview
Copy Layer
Rename Layer
Zoom to Native Resolution (100%)
Stretch Using Current Extent
Change raster datasource
Duplicate Layer
Remove Layer...
Set Layer Scale Visibility...
Set CRS
Export
Styles
Properties...
Copy Style
Paste Style
Add...
Rename Current...
default
Layers
Browser
Statistics
Statistic
Selected features only
Zoom to Coordinate
Enter 'Latitude, Longitude'
2. Paste it onto the new raster
Type to locate (Ctrl+K)
1 legend entries removed.
Coordinate 11.71,-19.01
Scale 1:5926130
Magnifier 100%
Rotation 0.0 °
Render
EPSG:4326



Q&A and Practice