7/1/2024

Vascular plant occurrences in Germany

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Creating a raster map displaying vascular plant occurrences involves several steps, including data collection, data processing, and map creation.

1. Collect Data

- **Occurrence Data**: Obtain georeferenced occurrence data for vascular plants. This data can often be sourced from biodiversity databases like GBIF (Global Biodiversity Information Facility).
- **Environmental Data**: Obtain raster layers that represent environmental variables (e.g., elevation, climate data) relevant to the occurrence of vascular plants.

2. Prepare Data

- **Clean Occurrence Data**: Ensure the data is clean and contains no duplicates or errors. Validate the georeferenced points.
- **Format Data**: Make sure your occurrence data is in a format compatible with GIS software (CSV).

3. Choose GIS Software

- Use GIS software like, ArcGIS, or an R package like `raster` or `sp`.

4. Create Raster Map

Using QGIS:

1. **Load Data**:
    - Import the occurrence data as a point layer.
    - Import any environmental raster layers.
2. **Rasterize Points**:
    - Convert the point layer to a raster layer using the "Rasterize (vector to raster)" tool.
    - Set the desired resolution and other parameters.
3. **Visualize and Style**:
    - Apply appropriate symbology to the raster layer to visually represent plant occurrences.
    - Use color gradients or classifications to distinguish between areas of high and low occurrence density.

Using R:

1. **Install Necessary Packages**:

```
R
install.packages(c("raster", "rgdal", "sp"))
library(raster)
```

```
library(rgdal)
library(sp)
```

To deal with a CSV file and extract location coordinates in R I follow these steps:

1. **Load the CSV file**.
2. **Extract the relevant columns**.
3. **Perform any necessary data cleaning**.
4. **Work with the coordinates.

Here's a step-by-step guide:

1. Load the CSV File

First, you need to read the CSV file into R. You can use the `read.csv()` function for this.

```r
# Load necessary library
library(tidyverse)

# Load the CSV file
data <- read.csv("path_to_your_file.csv")

# View the first few rows of the data
head(data)
```

2. Extract Relevant Columns

Assume my CSV file has columns named `latitude` and `longitude`. I'll want to extract these columns.

```r
# Extract latitude and longitude columns
coordinates <- data %>% select(latitude, longitude)

# View the extracted coordinates
head(coordinates)
```

3. Data Cleaning

Ensure there are no missing or invalid values in the coordinates.

```r
# Remove rows with missing or invalid coordinates
coordinates <- coordinates %>% drop_na()

# View the cleaned coordinates
head(coordinates)
```

4. Work with Coordinates

You can now use the coordinates for various purposes, such as plotting them on a map using the `ggplot2` library.

```r
# Load necessary libraries for mapping
library(ggplot2)
library(maps)
```

```
# Create a basic map with the coordinates
ggplot(data = coordinates, aes(x = longitude, y = latitude)) +
  borders("world", colour = "gray85", fill = "gray80") +
  geom_point(color = "blue", size = 1) +
  theme_minimal() +
  labs(title = "Location Coordinates", x = "Longitude", y = "Latitude")
```

This will plot the coordinates on a world map.

Complete Example

Putting it all together:

```r
# Load necessary libraries
library(tidyverse)
library(ggplot2)
library(maps)

# Load the CSV file
data <- read.csv("path_to_my_file.csv")

# Extract and clean the coordinates
coordinates <- data %>%
  select(latitude, longitude) %>%
  drop_na()

# Plot the coordinates on a map
ggplot(data = coordinates, aes(x = longitude, y = latitude)) +
```

```
  borders("world", colour = "gray85", fill = "gray80") +
  geom_point(color = "blue", size = 1) +
  theme_minimal() +
  labs(title = "Location Coordinates", x = "Longitude", y = "Latitude")
```

To interpolate the location of plants using Kernel Density Estimation (KDE) in ArcGIS Pro, I can follow these steps. KDE will help create a smooth, continuous surface representing the density of plant occurrences based on the point data.

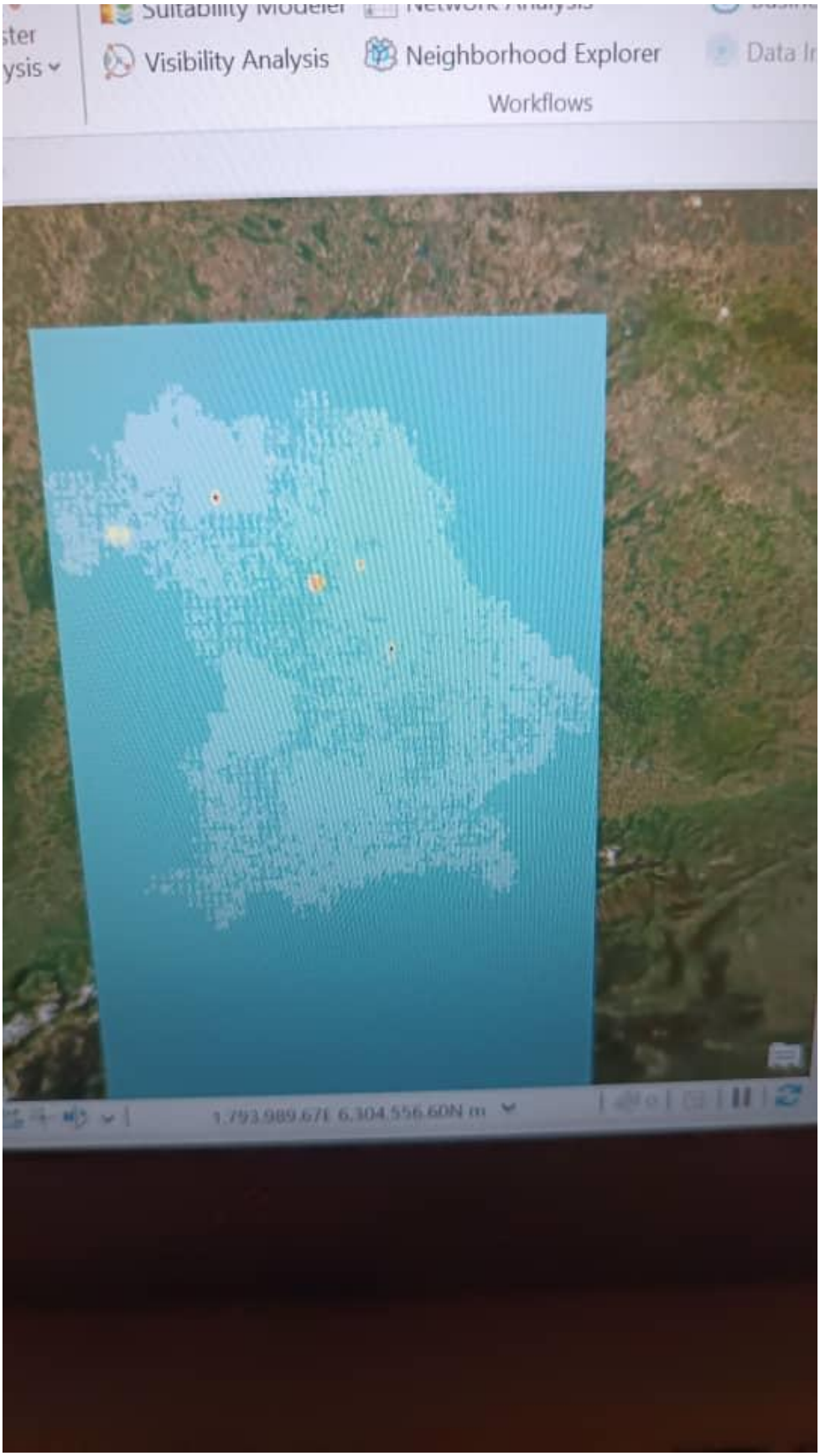
Step-by-Step Guide for Kernel Density Estimation in ArcGIS Pro

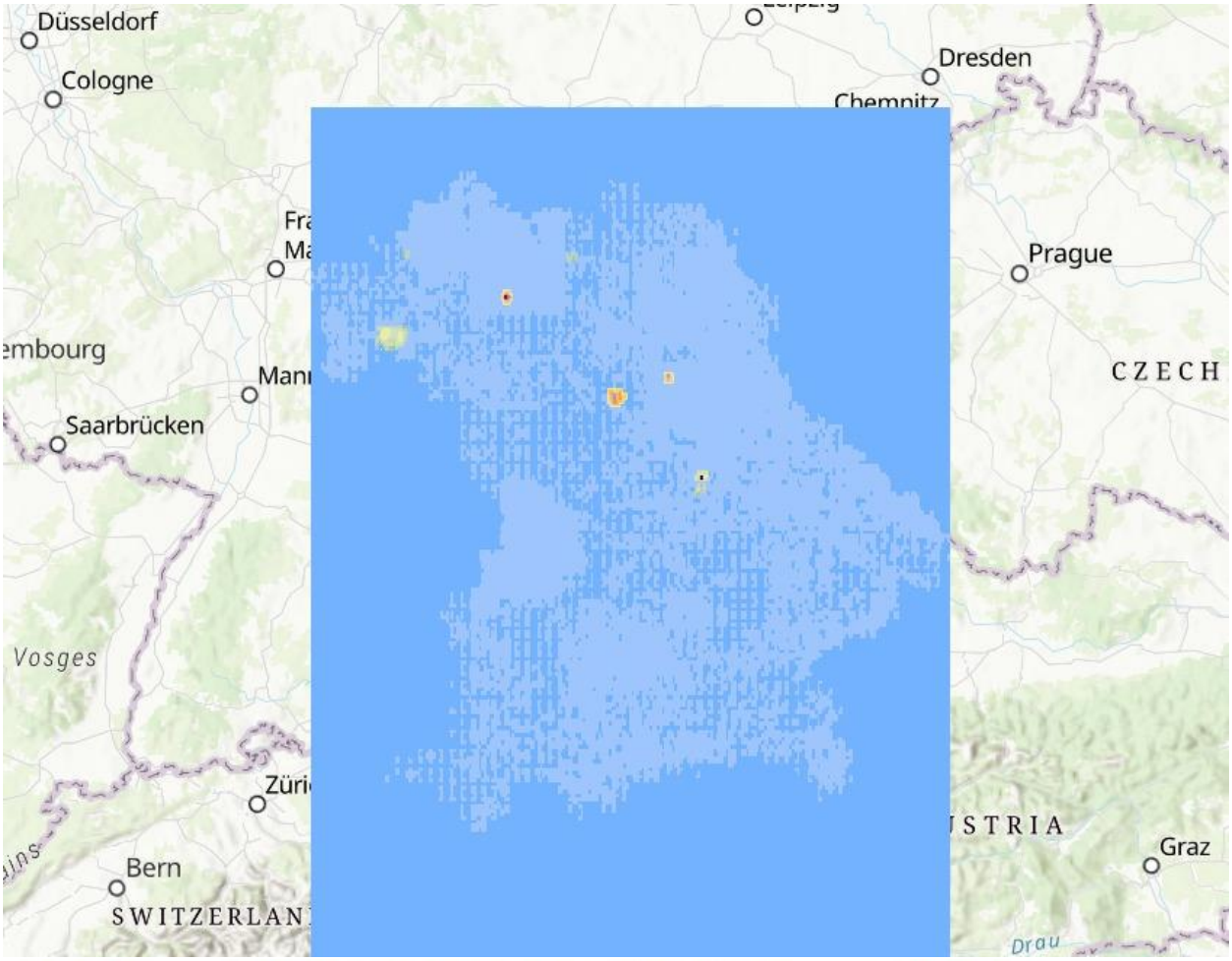
1. **Prepare Your Data:**
    - Ensure that your plant occurrence data is in a point feature class or shapefile, with each point representing a location where a plant has been observed.
2. **Add Your Data to ArcGIS Pro:**
    - Open ArcGIS Pro and create a new project.
    - Add your point feature class containing the plant occurrences to the map.
3. **Open the Kernel Density Tool:**
    - Go to the Analysis tab and click on Tools to open the Geoprocessing pane.
    - Search for "Kernel Density" and open the Kernel Density tool.
4. **Configure the Kernel Density Tool:**
    - **Input Point or Polyline Features:** Select your point feature layer containing plant occurrences.
    - **Population Field:** Choose a field representing the population or weight of the points. If you are just using presence data, you can choose "NONE."
    - **Output Raster Dataset:** Specify the location and name for the output raster.
    - **Output Cell Size:** Define the cell size for the raster. Smaller cell sizes give higher resolution.
    - **Search Radius:** Define the radius of the kernel function. This controls the spread of the density values and should be based on your study area and the nature of your data.
5. **Run the Kernel Density Tool:**
    - Click "Run" to generate the density raster from your point data.
6. **Symbolize the Raster:**
    - Once the raster is created, right-click the raster layer in the Contents pane and select "Symbology."
    - Choose an appropriate symbology, such as a color ramp, to represent the density values effectively.

Detailed Steps with Screenshots

1. **Open Kernel Density Tool:**
    - Go to Analysis > Tools > search for "Kernel Density" and open it.

2. **Configure Kernel Density Tool:**
    - Fill in the parameters for the Kernel Density tool.
3. **Symbolize the Raster:**
    - Right-click the raster layer > Symbology > choose an appropriate symbology


Visibility Analysis
Neighborhood Explorer
Workflows



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3	2770022	HUMAN_OBSERVATION	BFL	BFLportal01coll	8007161 / 28923665
4	3085810	HUMAN_OBSERVATION	BFL	BFLportal01coll	6897072 / 5771601
5	2975014	HUMAN_OBSERVATION	BFL	BFLportal01coll	8007162 / 28923725
6	5359429	HUMAN_OBSERVATION	BFL	BFLportal01coll	6897072 / 5771618

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3	NA	NA	NA	CC_BY_4_0	NA	Hartmann, Walter
4	NA	NA	NA	CC_BY_4_0	NA	Bayernatlas-Daten
5	NA	NA	NA	CC_BY_4_0	NA	Hartmann, Walter
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	issue
1	REFERENCES_URI_INVALID;CONTINENT_DERIVED_FROM_COORDINATES
2	REFERENCES_URI_INVALID;CONTINENT_DERIVED_FROM_COORDINATES
3	REFERENCES_URI_INVALID;CONTINENT_DERIVED_FROM_COORDINATES
4	REFERENCES_URI_INVALID;CONTINENT_DERIVED_FROM_COORDINATES
5	REFERENCES_URI_INVALID;CONTINENT_DERIVED_FROM_COORDINATES
6	REFERENCES_URI_INVALID;CONTINENT_DERIVED_FROM_COORDINATES

```
                                                                locality stateProvince
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2                                                                             NA
3 Biot.(5/6) Brikenrain, Birkensee / Heiligenschlag, sö. Rannungen            NA
4                                                                             NA
5     Biot.(82) Rund um den Sportplatz (Wald / Felldflur), Diebach            NA
6                                                                             NA
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4           48.57            12.71                           NA                  NA
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6        NA                NA    NA            NA       1945  NA    NA 1945  5359429
  speciesKey     basisOfRecord institutionCode  collectionCode      catalogNumber
4 Tracheophyta Magnoliopsida Caryophyllales Caryophyllaceae     Spergula
5 Tracheophyta Magnoliopsida        Fabales        Fabaceae        Vicia
5 Tracheophyta Magnoliopsida        Fabales        Fabaceae    Trifolium
                  species infraspecificEpithet taxonRank
1      Pulmonaria obscura                        SPECIES
2           Rubus caesius                        SPECIES
3 Polygonatum multiflorum                        SPECIES
4       Spergula arvensis                        SPECIES
5            Vicia sativa                        SPECIES
5         Trifolium dubium                        SPECIES
                     scientificName            verbatimScientificName
1        Pulmonaria obscura Dumort.        Pulmonaria obscura Dumort.
2                  Rubus caesius L.                  Rubus caesius L.
3 Polygonatum multiflorum (L.) All. Polygonatum multiflorum (L.) All.
4              Spergula arvensis L.              Spergula arvensis L.
5           Vicia segetalis Thuill.           Vicia segetalis Thuill.
5           Trifolium dubium Sibth.           Trifolium dubium Sibth.
  verbatimScientificNameAuthorship countryCode
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2                               NA          DE
3                               NA          DE
4                               NA          DE
5                               NA          DE
5                               NA          DE
                                                                locality stateProvince
1 Biot.(5/6) Brikenrain, Birkensee / Heiligenschlag, sö. Rannungen            NA
2                                                                             NA
3 Biot.(5/6) Brikenrain, Birkensee / Heiligenschlag, sö. Rannungen            NA
4                                                                             NA
5     Biot.(82) Rund um den Sportplatz (Wald / Felldflur), Diebach            NA
```

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4 2810624158 64dabd3c-4f34-4520-b9dd-d227a0bf1582
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6 2812013088 64dabd3c-4f34-4520-b9dd-d227a0bf1582
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2  http://id.snsb.info/bfl/collection_bayernflora/6897072/5768069 Plantae
3 http://id.snsb.info/bfl/collection_bayernflora/8007161/28923665 Plantae
4  http://id.snsb.info/bfl/collection_bayernflora/6897072/5771601 Plantae
5 http://id.snsb.info/bfl/collection_bayernflora/8007162/28923725 Plantae
6  http://id.snsb.info/bfl/collection_bayernflora/6897072/5771618 Plantae
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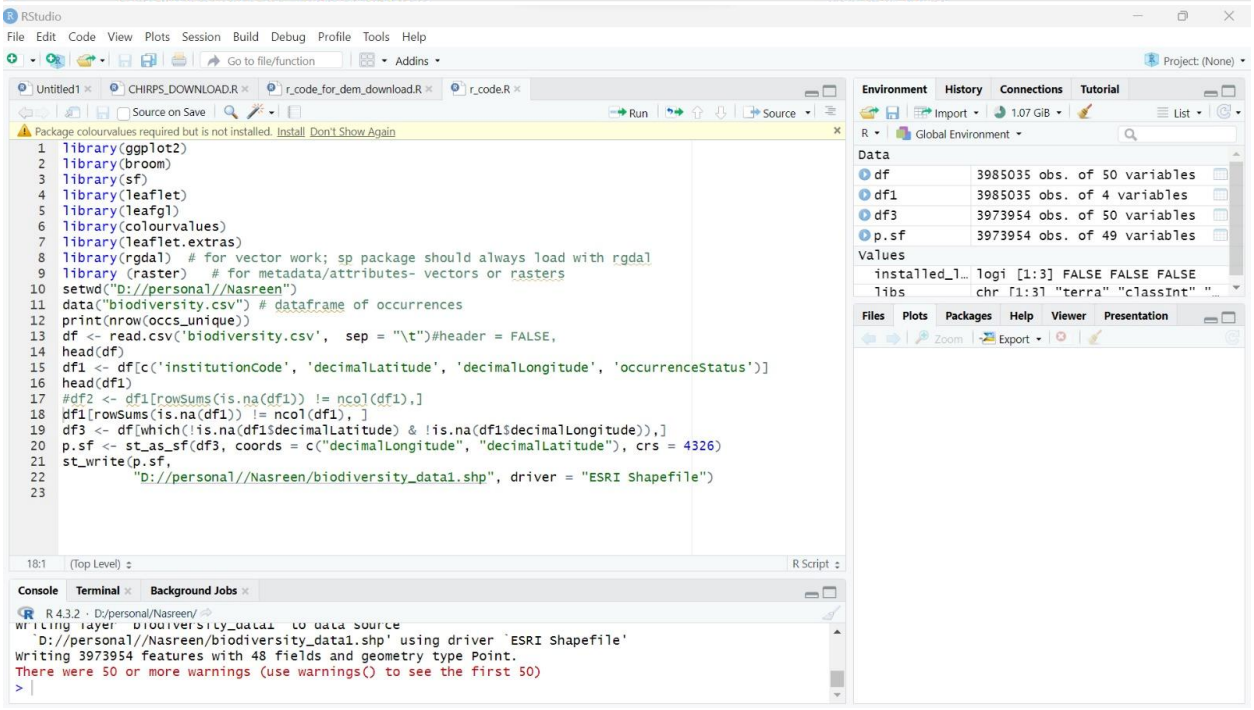
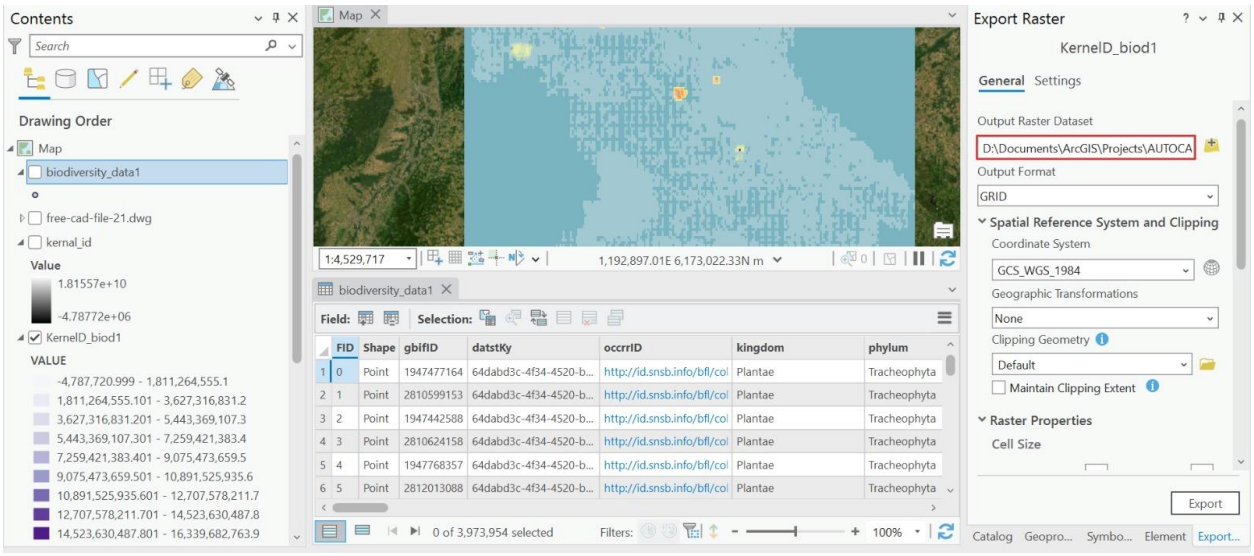
1 Tracheophyta Magnoliopsida    Boraginales    Boraginaceae  Pulmonaria
2 Tracheophyta Magnoliopsida        Rosales        Rosaceae       Rubus
3 Tracheophyta    Liliopsida    Asparagales    Asparagaceae Polygonatum
4 Tracheophyta Magnoliopsida Caryophyllales Caryophyllaceae    Spergula
5 Tracheophyta Magnoliopsida        Fabales        Fabaceae       Vicia
6 Tracheophyta Magnoliopsida        Fabales        Fabaceae   Trifolium
                species infraspecificEpithet taxonRank
1      Pulmonaria obscura                      SPECIES
```

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4 Point 1947768357 64dabd3c-4f34-4520-b... http://id.snsb.info/bfl/col Plantae Tracheophyta
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Spatial Reference System and Clipping
Coordinate System
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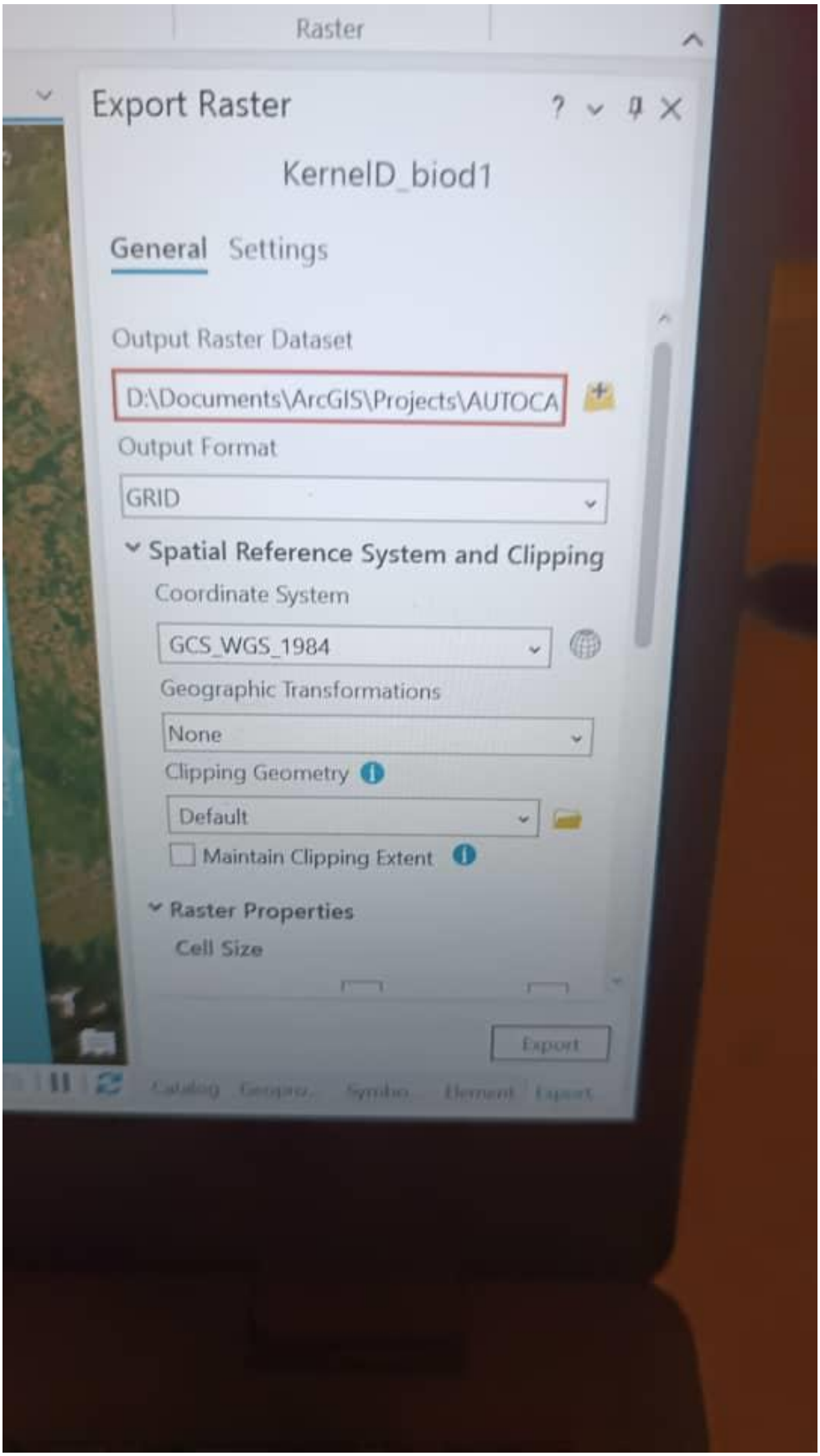
Export
Catalog Geopro... Symbo... Element Export...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Spatial Reference System and Clipping
Coordinate System
GCS_WGS_1984
Geographic Transformations
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Default
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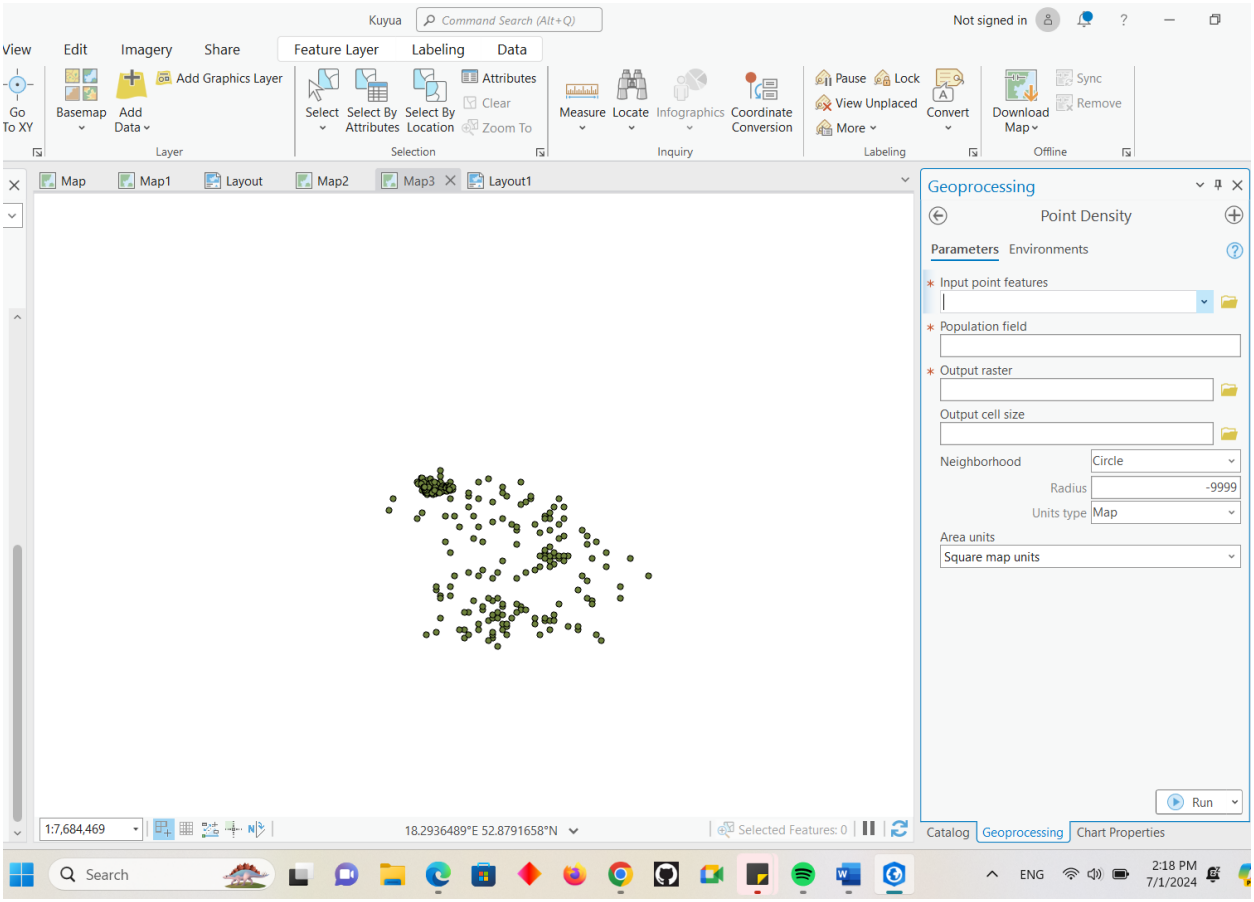
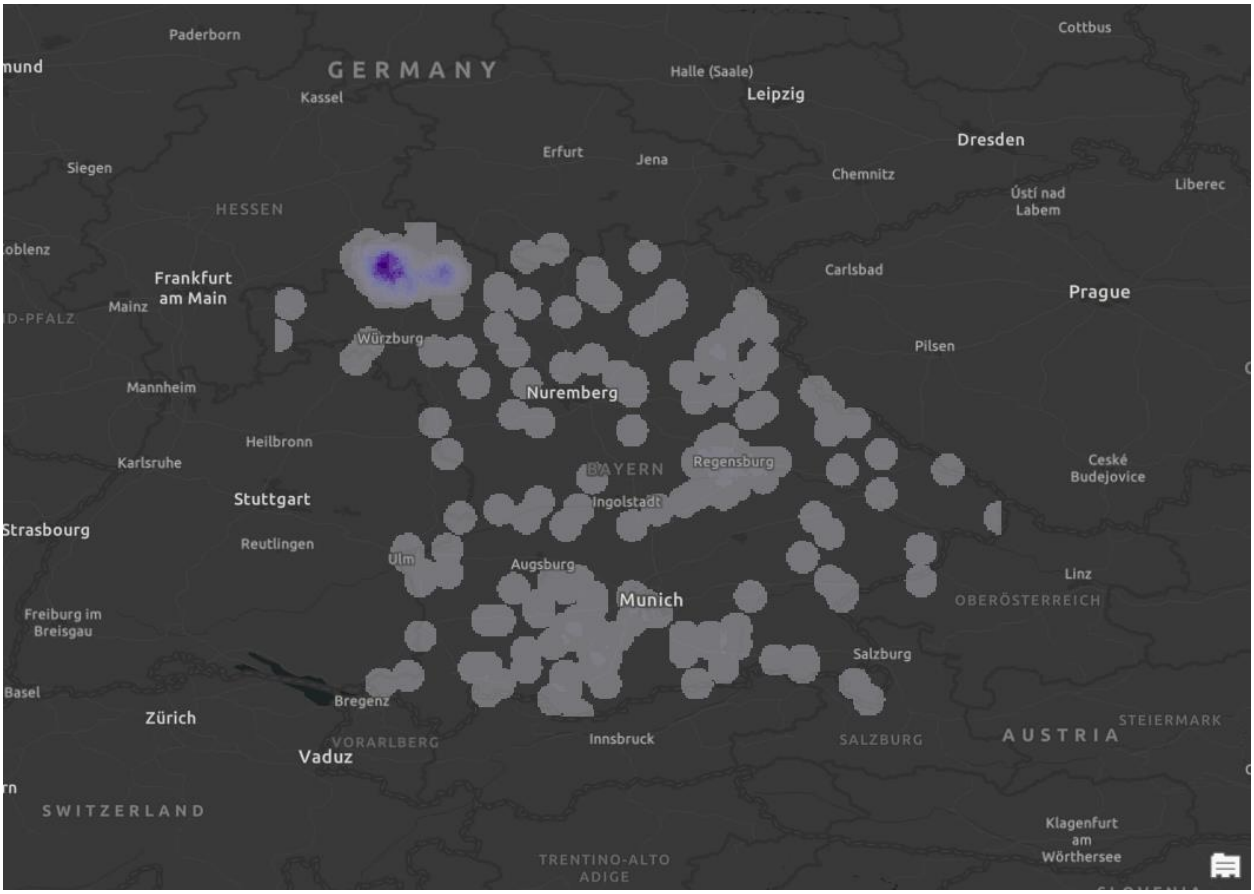
Raster Properties
Cell Size
Export

I use 'occurrenceStatus' field and give (0,1) to it convert text to integer (values).

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HESSEN
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Prague
Würzburg
Pilsen
Mannheim
Nuremberg
Heilbronn
Karlsruhe
BAYERN
Regensburg
Ceské Budejovice
Stuttgart
Ingolstadt
Strasbourg
Reutlingen
Ulm
Augsburg
Linz
Munich
OBERÖSTERREICH
Freiburg im Breisgau
Salzburg
Basel
Bregenz
Zürich
STEIERMARK
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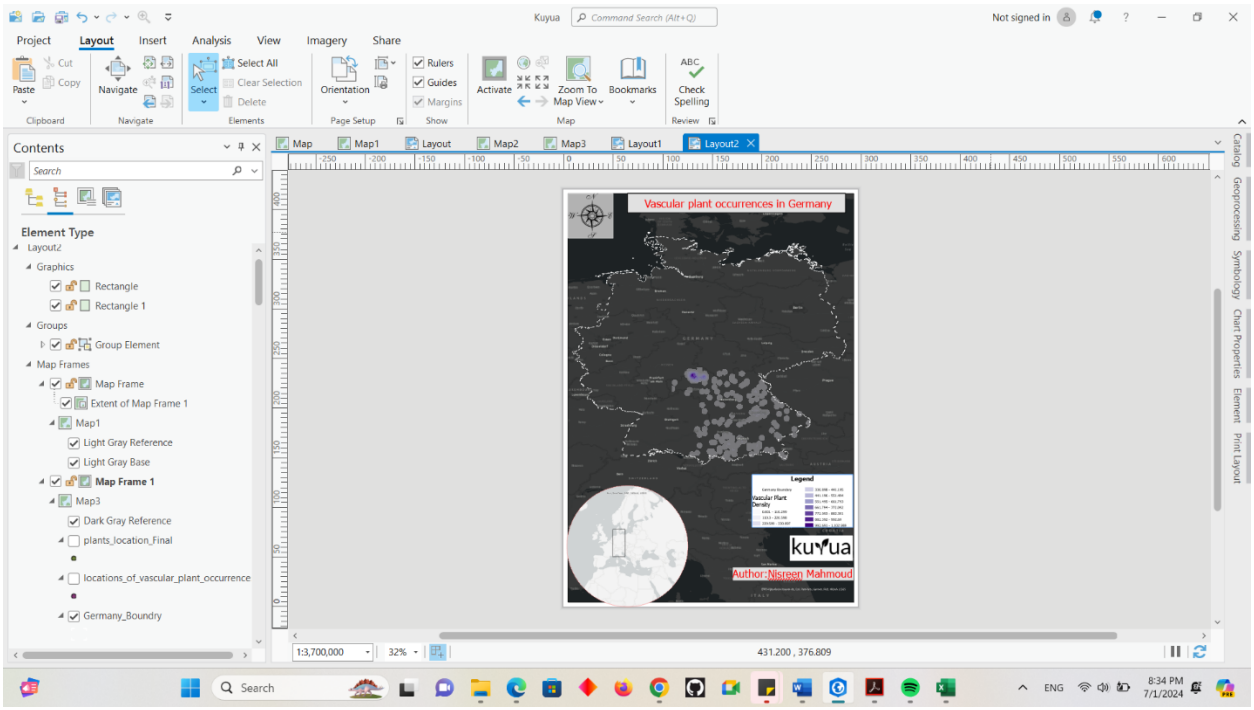
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Analysis
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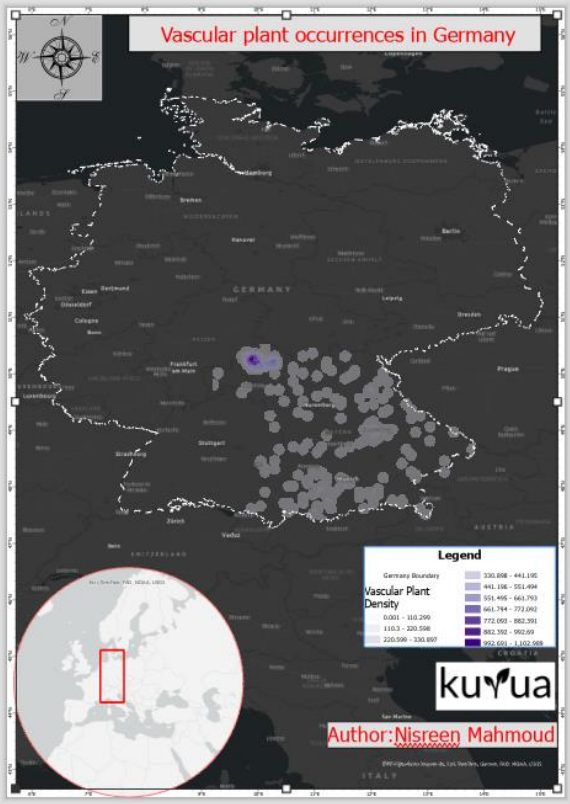
Element Type
Vascular plant occurrences in Germany
Legend
kuyua
Author: Nisreen Mahmoud


Vascular plant occurrences in Germany
GERMANY
AUSTRIA
SWITZERLAND
ITALY
Legend
Germany Boundary
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330.898 - 441.195
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551.495 - 661.793
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772.093 - 882.391
882.392 - 992.69
992.691 - 1,102.989
kuvua
Author:Nisreen Mahmoud