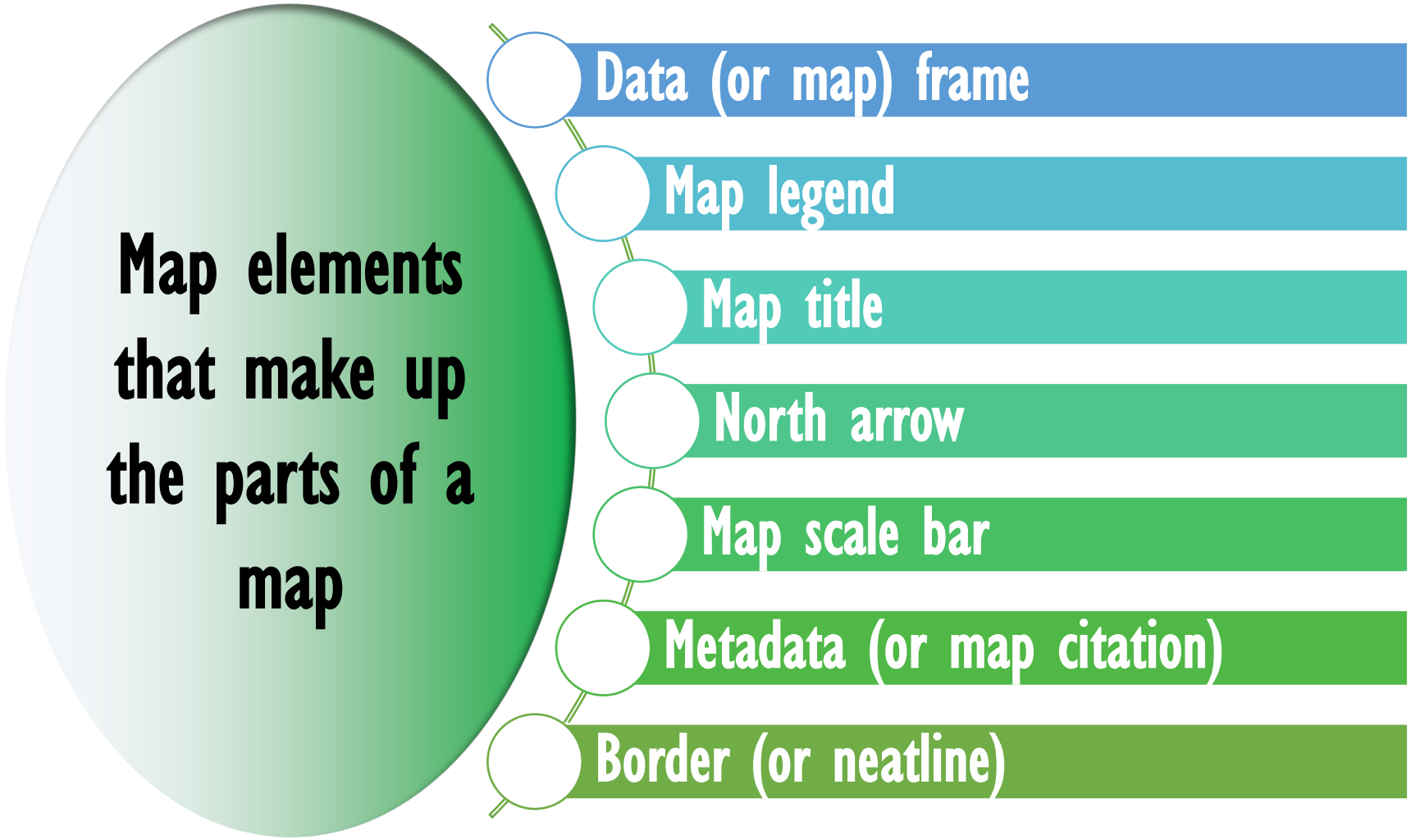
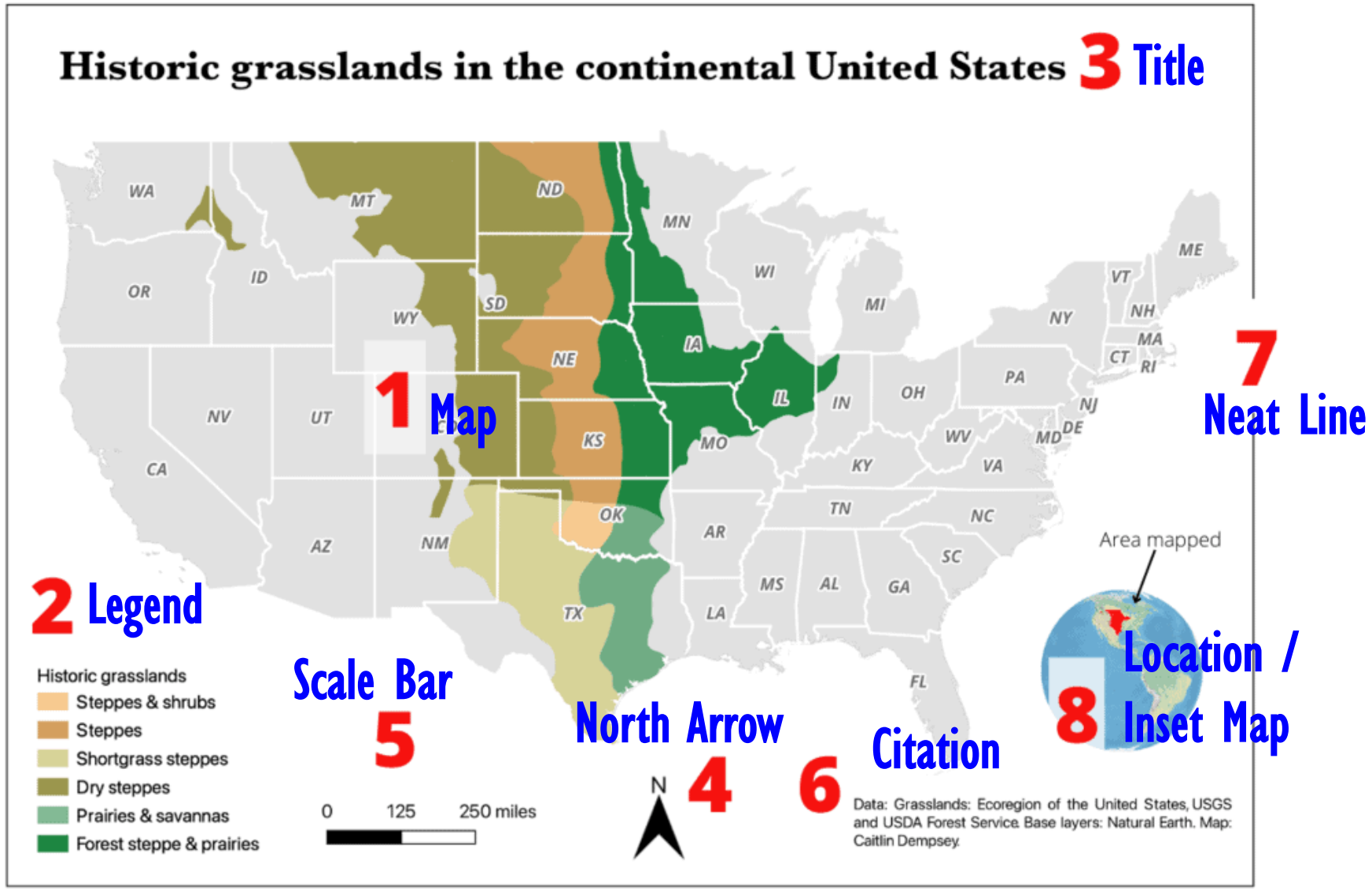
Spatial Data Visualization

Visualization Process, Strategies & Cartography



Map Elements

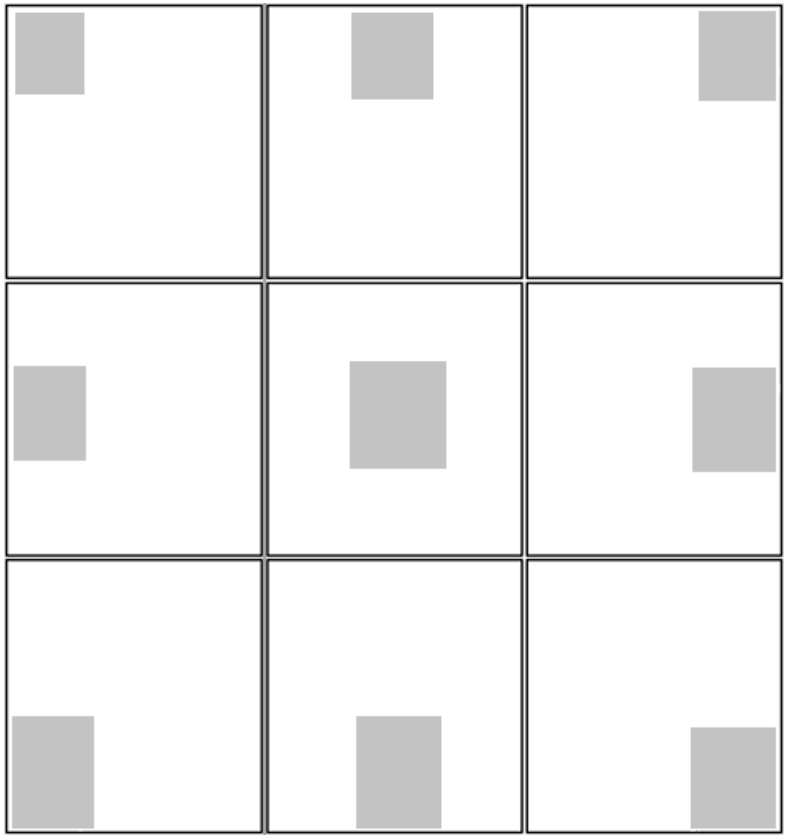


Also consider the following,

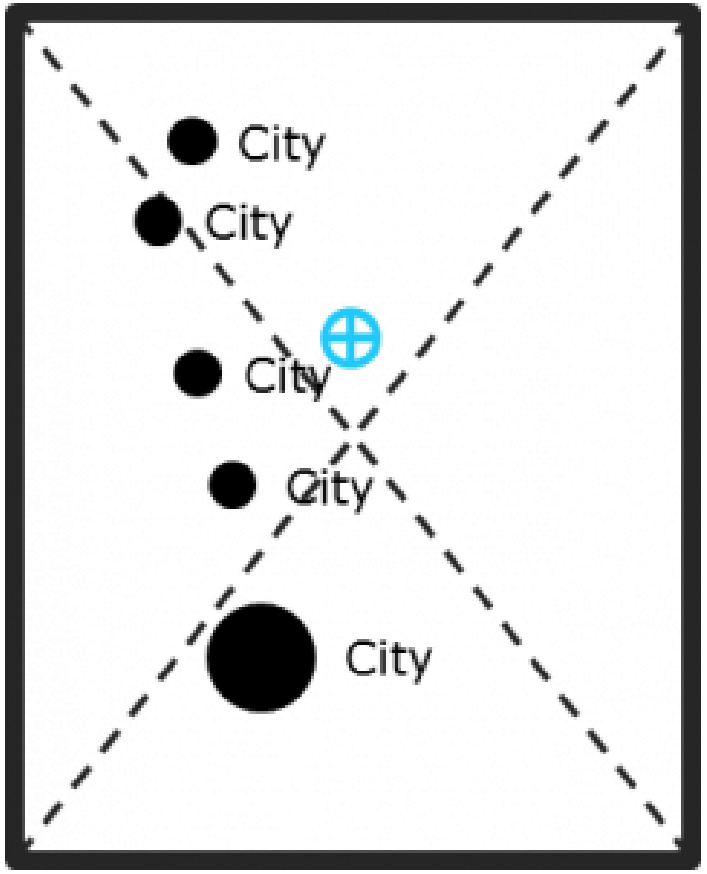
- Size
- Shape
- Symbol
  - Size: Static | Proportional
  - Colour: Static | Graded
  - Display: Classified | Raw
- Content

Planar Organization

- Balance, Focus of Attention, and Internal Organization.
  - Balance
    - Weight refers to the location, size, and shape of the map element
    - Direction refers to the relative location, shape, and subject of the map elements
    - White Balance



Focus of Attention



Internal Organization

- To create a strong, structured internal organization.

Hierarchical Organization

- What do you want them to notice first?
- Which of the three maps below is best?

Data Dissemination

Serve various reports, map layouts, presentations and other intelligence products from the results and visualizations.

Conventional Methods	Web Services
• Print Maps, Atlas, Desktop Products & other static maps	• Use of internet in map publishing

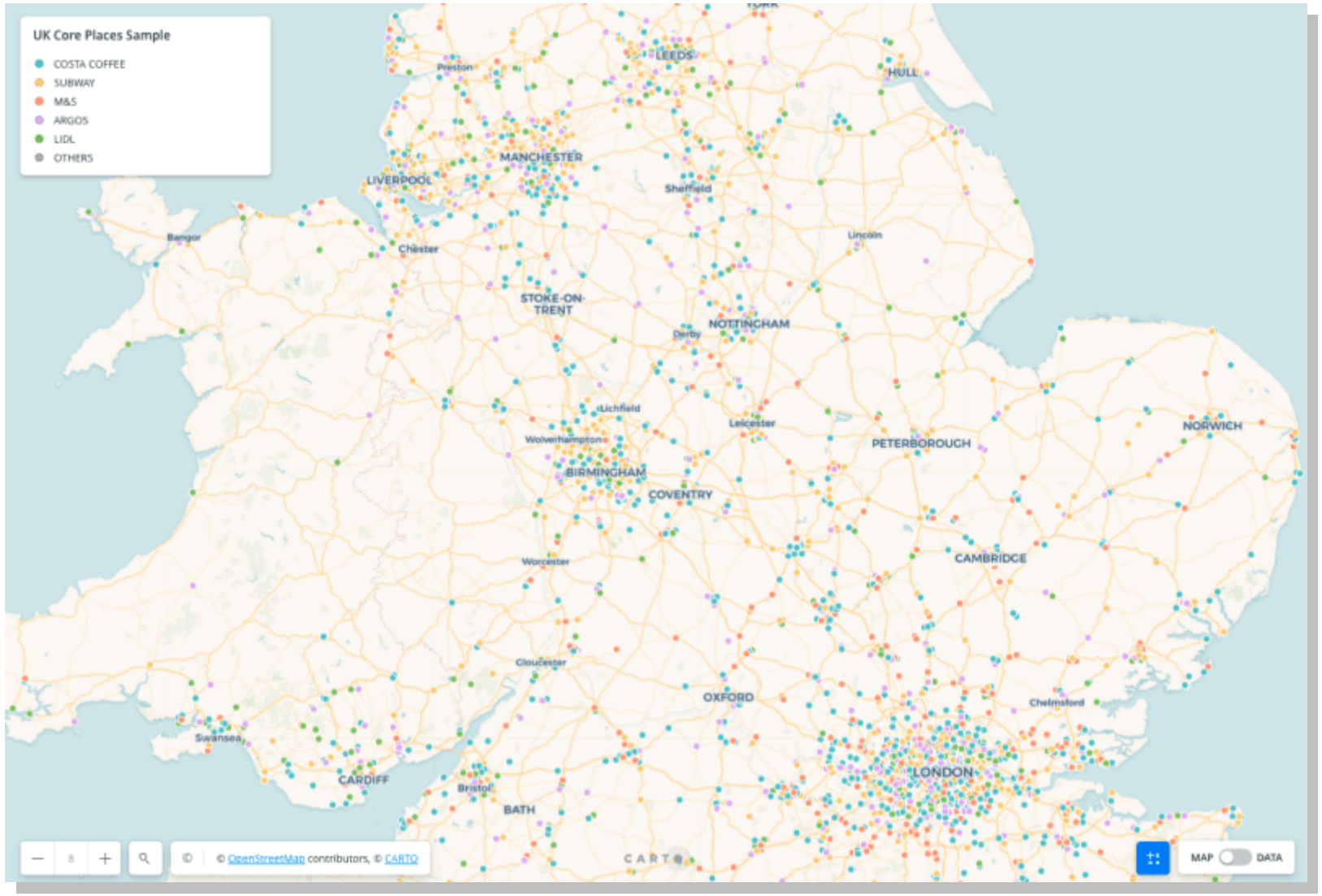
OGC Services for Data Dissemination

- OGC defines several types of services for serving different kinds of data and maps. ArcGIS Enterprise supports the following OGC service types:
  - Web Map Service (WMS) for serving collections of layers as map images
  - Web Map Tile Service (WMTS) for serving map layers as cached map tiles
  - Web Feature Service (WFS) and OGC API Features Service for serving data as vector features
  - Web Coverage Service (WCS) for serving data as raster coverages
  - Web Processing Service (WPS) for serving geospatial processing

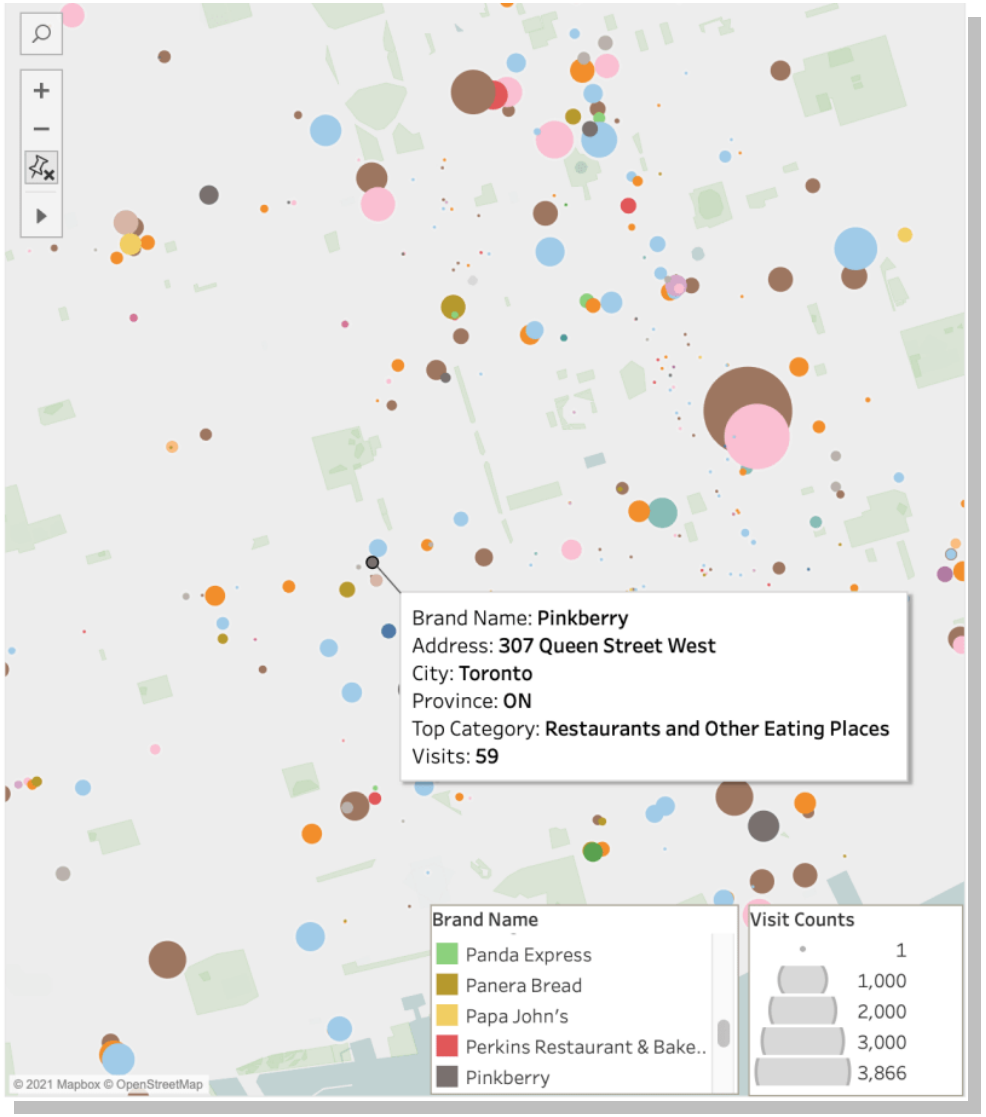
Service Type	WCS	WFS	WMS	WMTS	WPS
Map Services	✓	✓	✓	✓	
Geodata Services	✓				
Image Services	✓		✓	✓	
Geoprocessing Services					✓

Vector Data Visualization

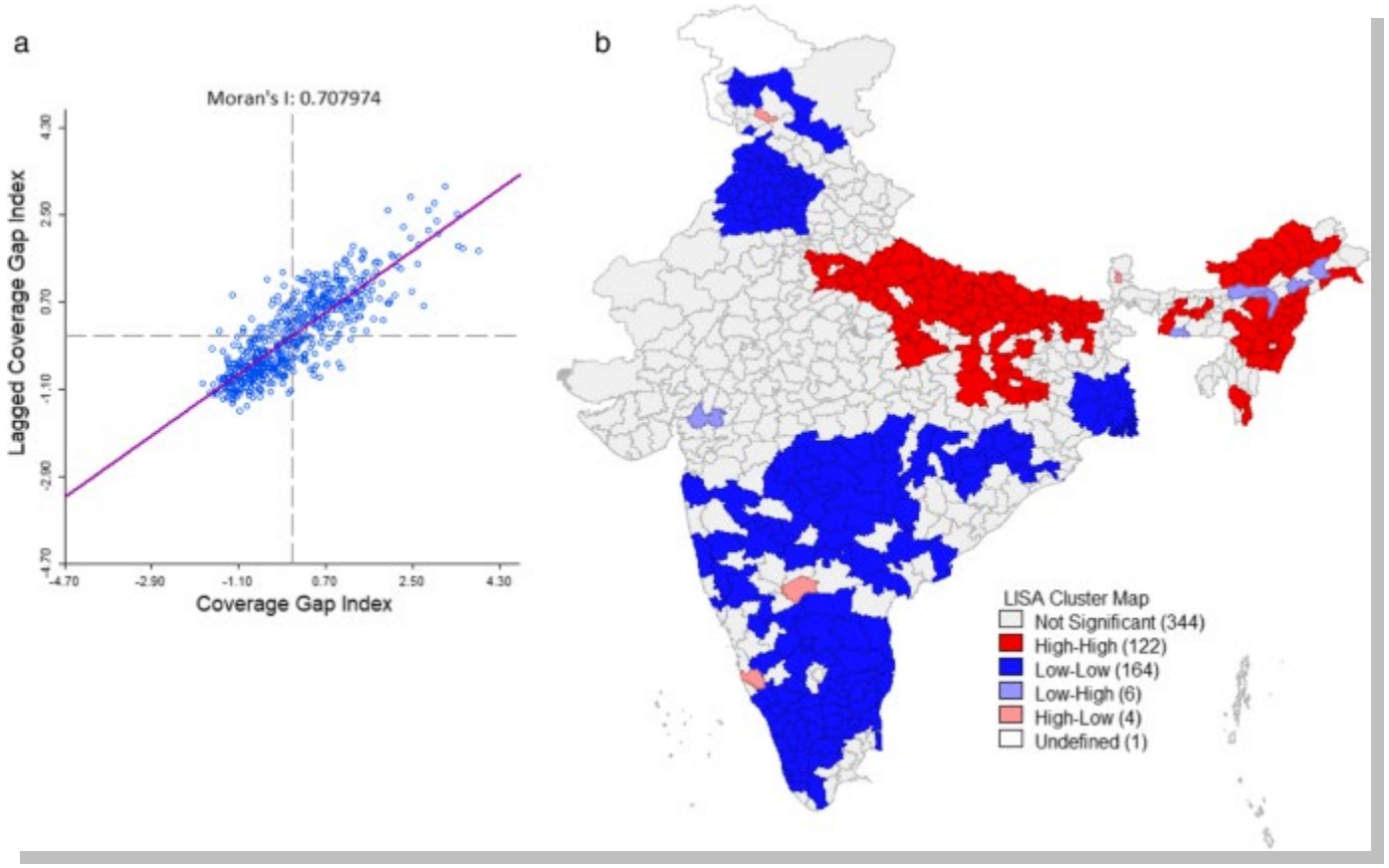
1. Point Map


UK Core Places Sample
COSTA COFFEE
SUBWAY
M&S
ARGOS
LIDL
OTHERS
LEEDS
HULL
Preston
MANCHESTER
LIVERPOOL
Sheffield
Bangor
Chester
Lincoln
STOKE-ON-TRENT
NOTTINGHAM
Derby
Lichfield
Leicester
NORWICH
Wolverhampton
PETERBOROUGH
BIRMINGHAM
COVENTRY
CAMBRIDGE
Worcester
Gloucester
OXFORD
Chelmsford
Swansea
CARDIFF
Bristol
BATH
LONDON
© OpenStreetMap contributors, © CARTO
MAP
DATA

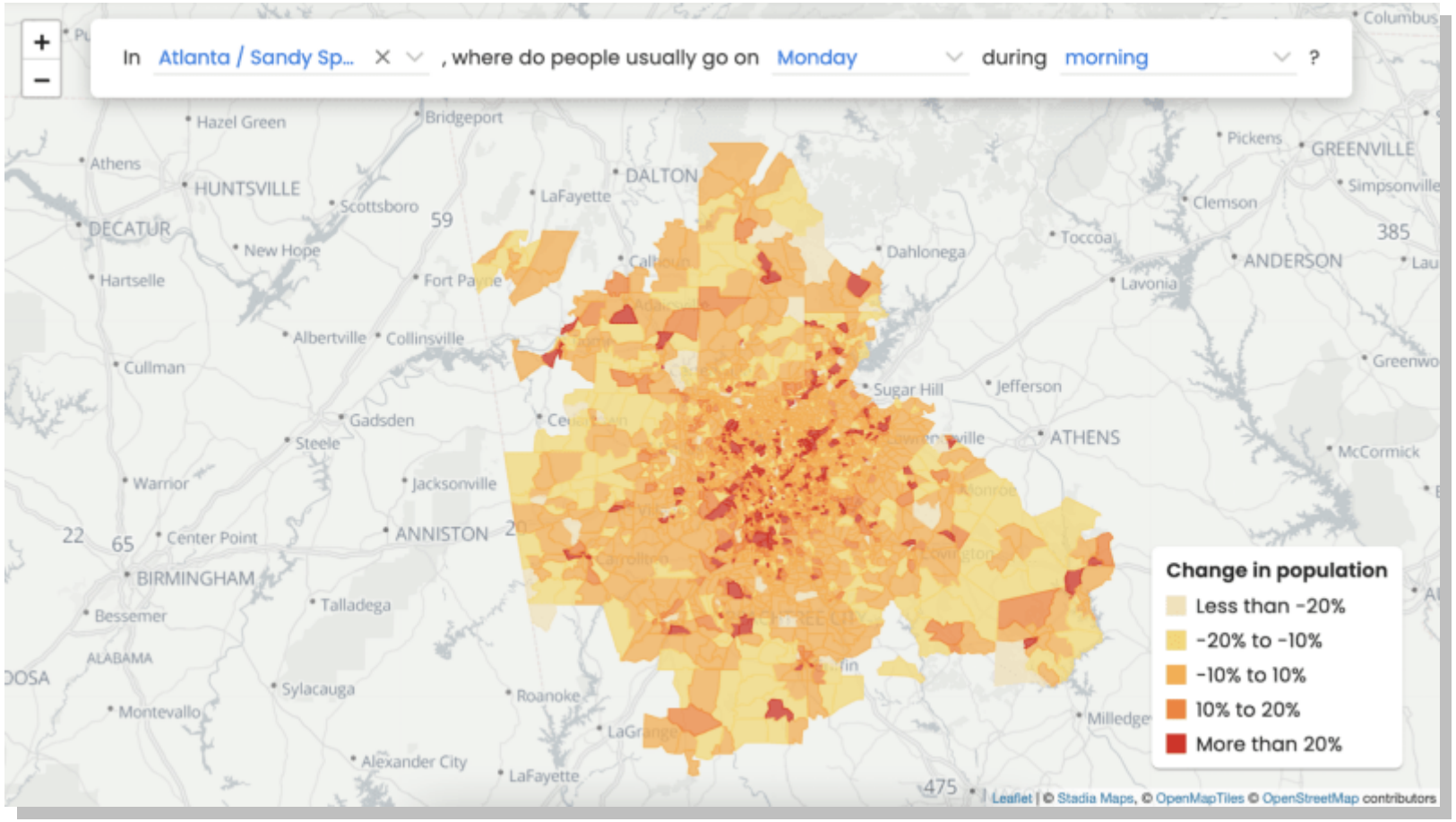
2. Proportional Symbol Map



3. Cluster Map



4. Choropleth map



5. Cartogram


World Population in 2018
The country's size in this map represents the size of the population.
Each square [▪] represents 500,000 people.
All 15,266 squares show where the world's 7.633 billion people live.
by Max Roser for OurWorldInData.org – the free online publication that presents the research and data to make progress against the world's largest problems.
Population data from the United Nations Population Division
Version 3 (October 2018)
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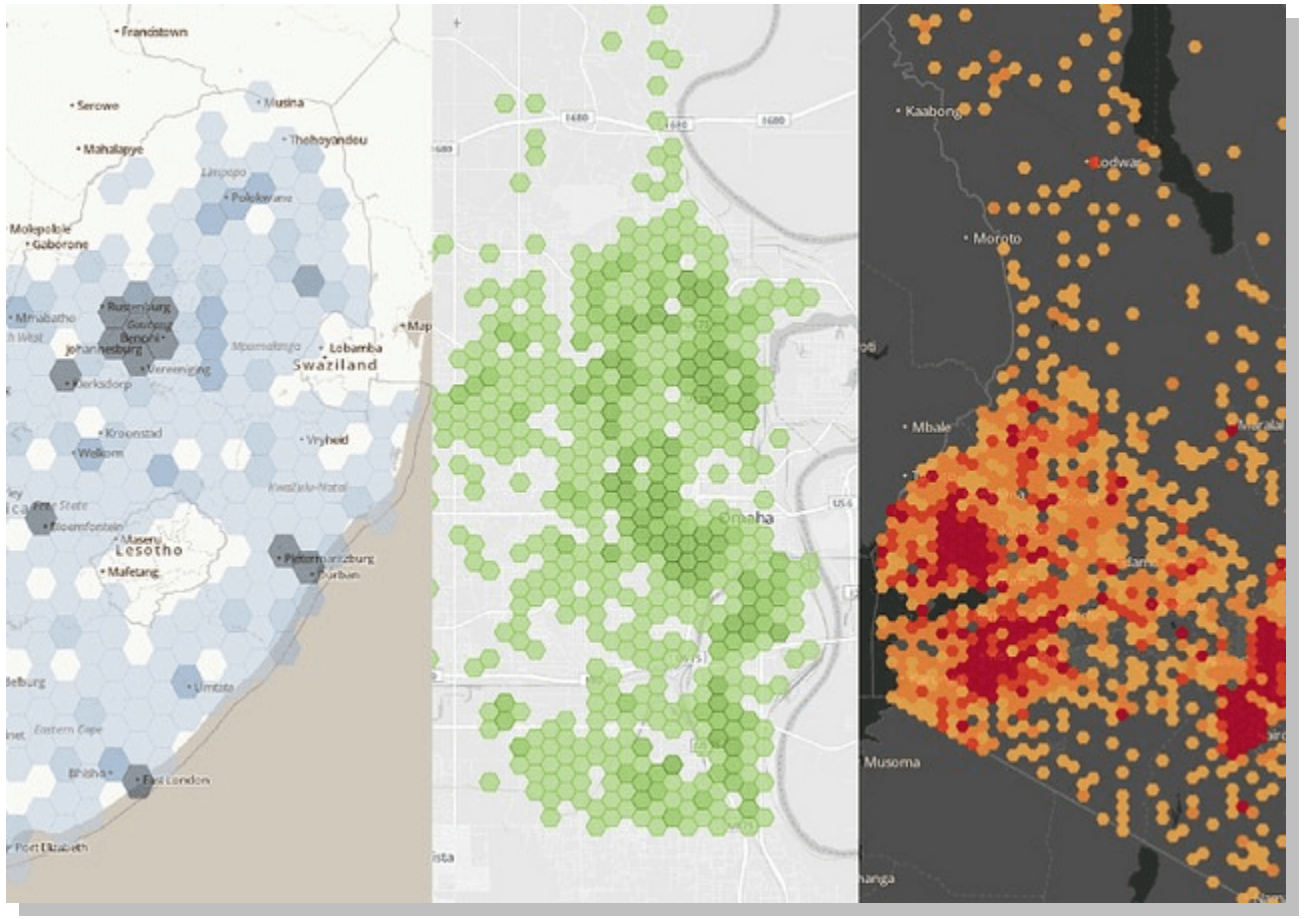
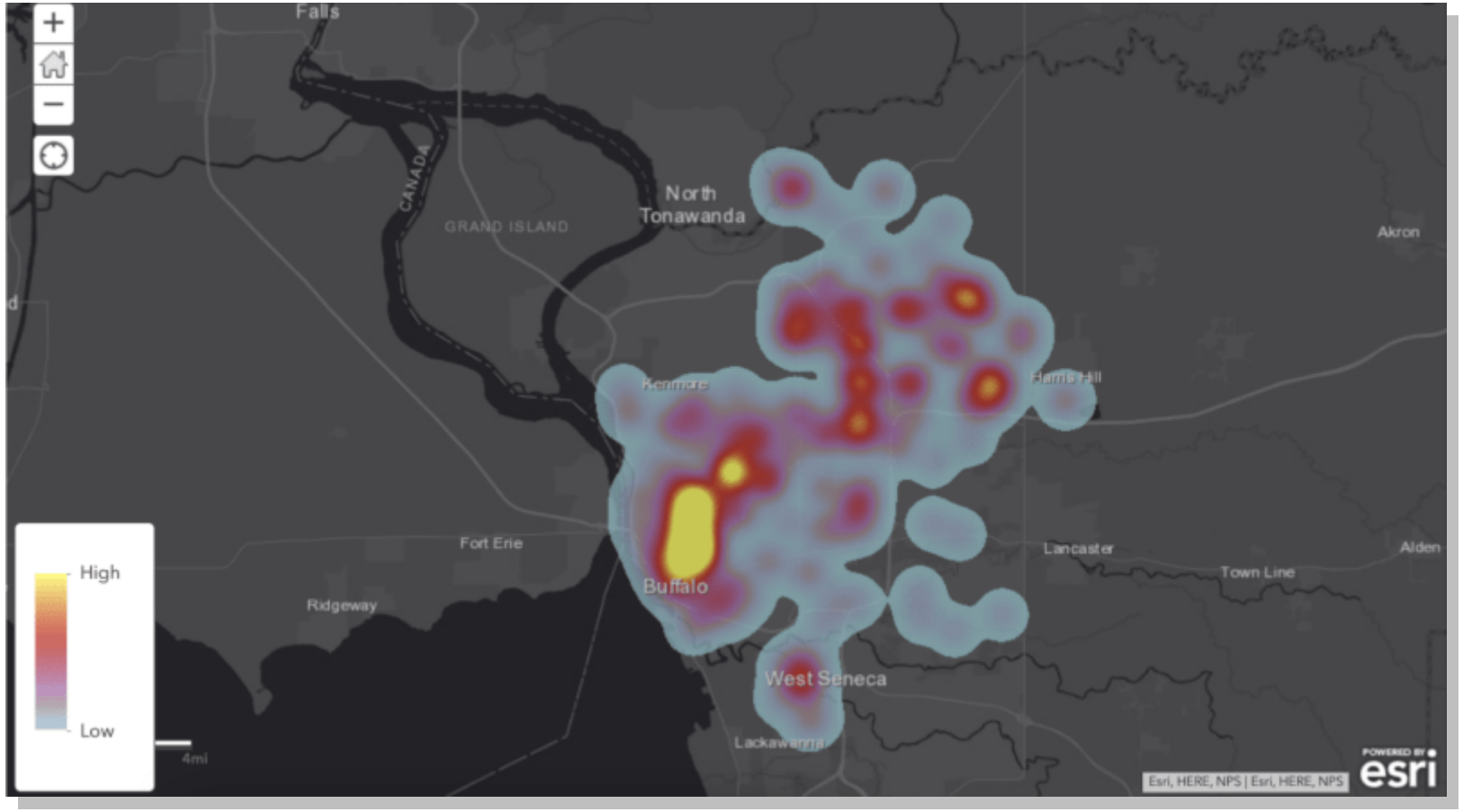
Our World in Data
North America, Central America and the Caribbean in total 587 million
7.7% of the world population
United States 326.8 million
4.3% of the world population
Canada 37m
Mexico 130.8m
South America total 428 million
5.6% of the world population
Brazil 210.9m
2.8% of the world
Argentina 44.7m
Colombia 49.5m
Venezuela 32.4m
Peru 32.6 million
Chile 18.2 million
Ecuador 16.9m
Europe in total 711 million
9.3% of the world population
Russia 144 million
Asian part of Russia 34 million
Germany 82.3m
France 65.2m
United Kingdom 66.6 million
Italy 59.3m
Spain 46.4m
Poland 38.1m
Ukraine 44m
Turkey 81.9m
Africa in total 1.288 billion
16.9% of the world population
Nigeria 195.9m
Egypt 99.4m
Ethiopia 107.5m
D.R. Congo 84 million
Tanzania 59.1m
Kenya 51m
Uganda 44.3m
Algeria 42m
Sudan 41.5m
Morocco 36.2m
Angola 30.8 million
Mozambique 30.5m
Madagascar 26.3 million
South Africa 57.4m
Asia in total 4.568 billion
59.8% of the world population
China 1.415 billion
18.5% of the world population
India 1.354 billion
17.7% of the world population
Pakistan 200.8m
Iran 82m
Iraq 39.3m
Saudi Arabia 33.6m
Yemen 28.9m
Uzbekistan 32.4m
Kazakhstan 18.4m
Afghanistan 36.4m
Nepal 29.6m
Bangladesh 166.4m
Myanmar 53.9m
Thailand 69.2m
Vietnam 96.5m
Malaysia 32m
Indonesia 266.8m
Philippines 106.5m
Japan 127.2m
South Korea 51.2m
North Korea 25.6m
Taiwan 23.7m
Hong Kong 7.4m
Oceania in total 41 million
0.5% of the world population
Australia 24.8m
New Zealand 4.7m
Papua New Guinea 8.4m

6. Binning Map

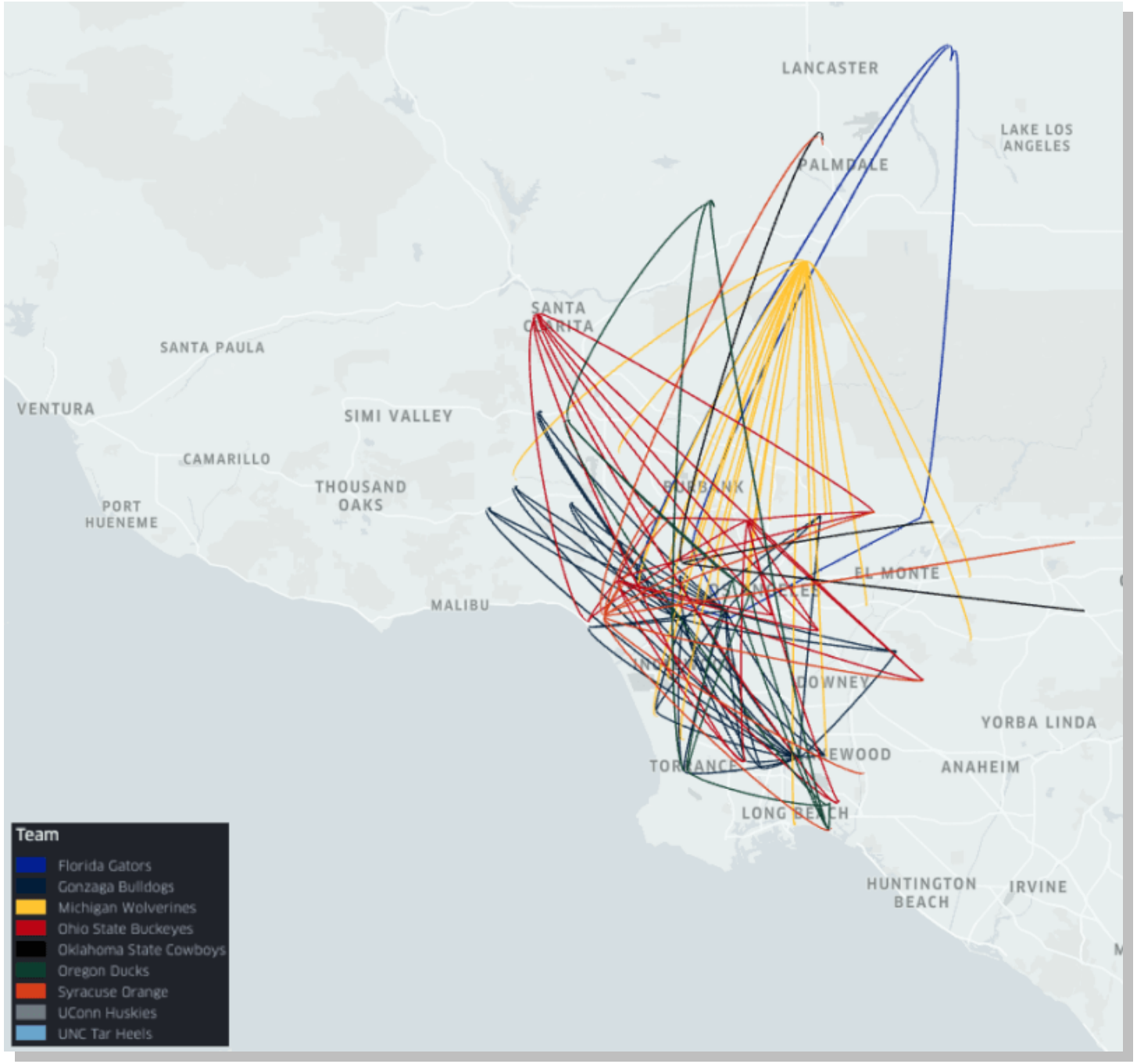


7. Heat Map

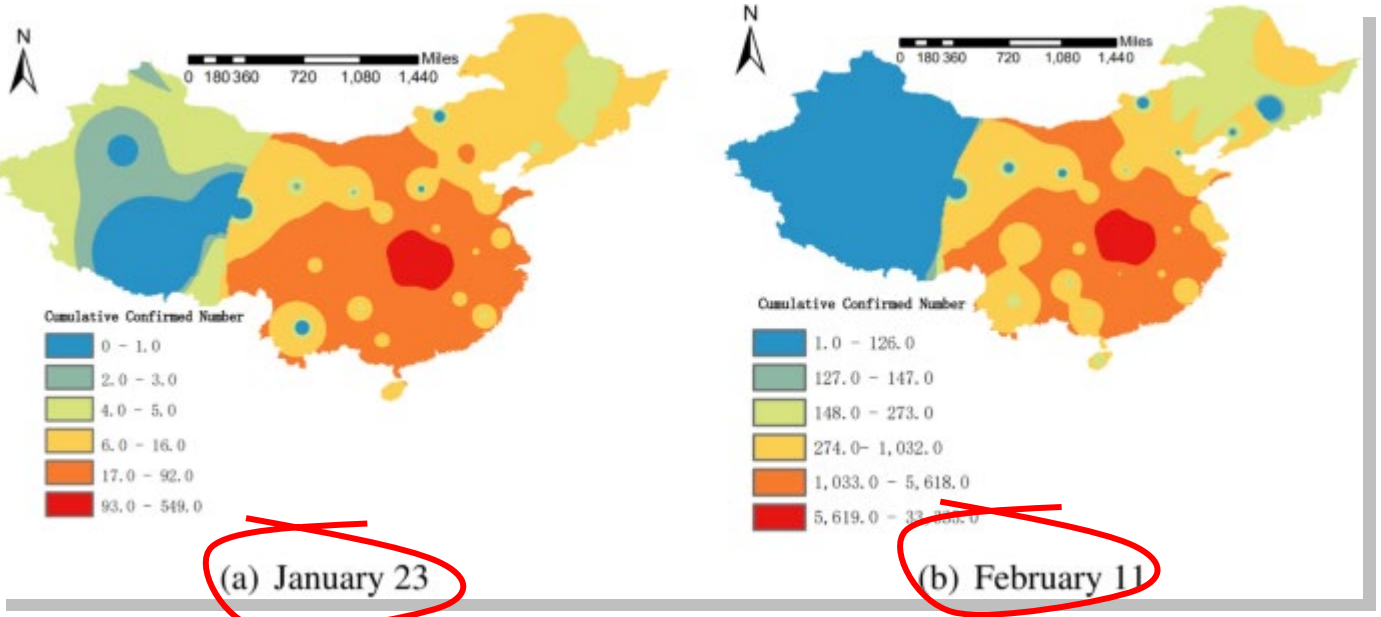

Falls
CANADA
GRAND ISLAND
North
Tonawanda
Akron
Kenmore
Hamburg
Fort Erie
Buffalo
Ridgeway
Lancaster
Town Line
Alden
West Seneca
Lackawanna
High
Low
4mi
Esri, HERE, NPS | Esri, HERE, NPS
POWERED BY
esri

8. Topographic Map

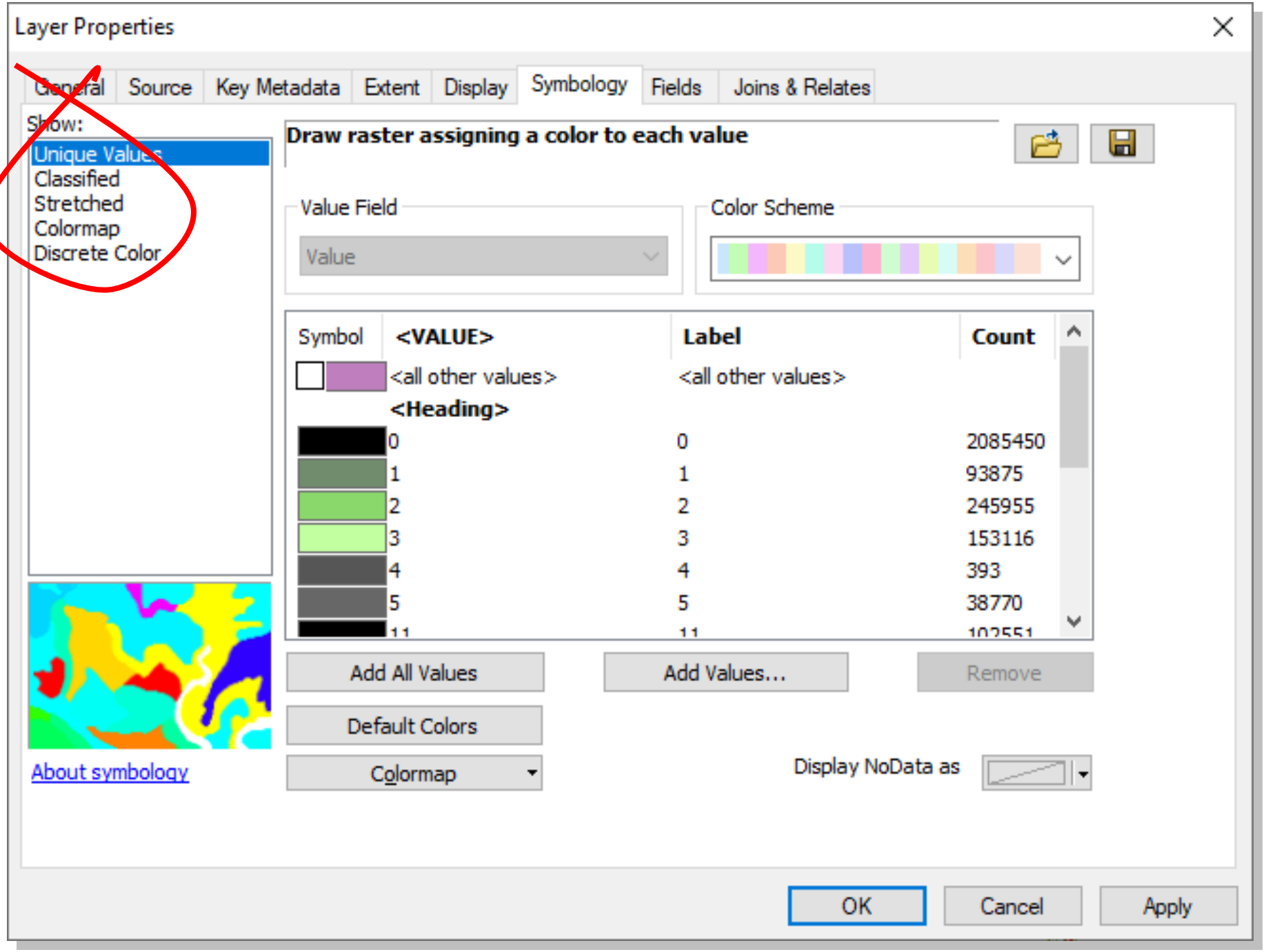
9. Flow Map


LANCASTER
LAKE LOS ANGELES
PALMDALE
SANTA CLARITA
SANTA PAULA
VENTURA
SIMI VALLEY
CAMARILLO
THOUSAND OAKS
PORT HUENEME
MALIBU
BURBANK
EL MONTE
DOWNEY
YORBA LINDA
TORRANCE
ANAHEIM
LONG BEACH
HUNTINGTON BEACH
IRVINE
Team
Florida Gators
Gonzaga Bulldogs
Michigan Wolverines
Ohio State Buckeyes
Oklahoma State Cowboys
Oregon Ducks
Syracuse Orange
UConn Huskies
UNC Tar Heels

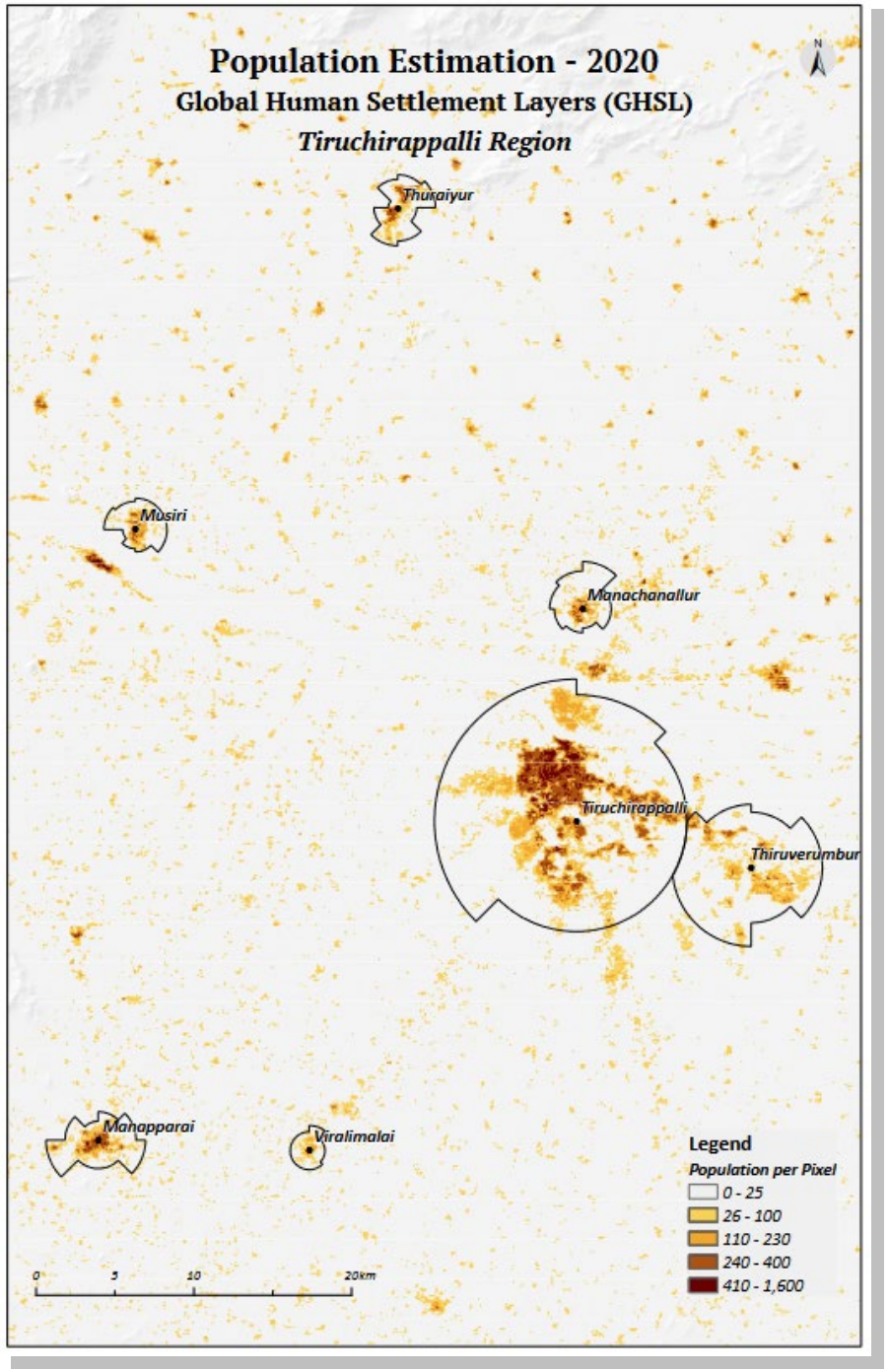
10. Time-space Distribution Map

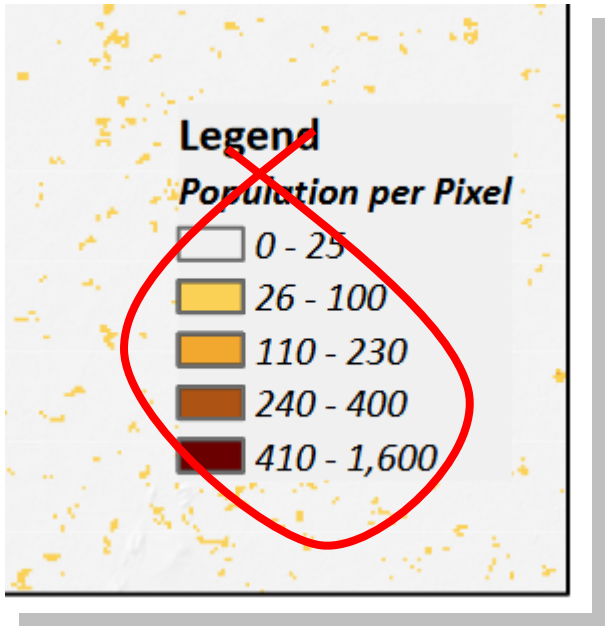


Raster Data Visualization

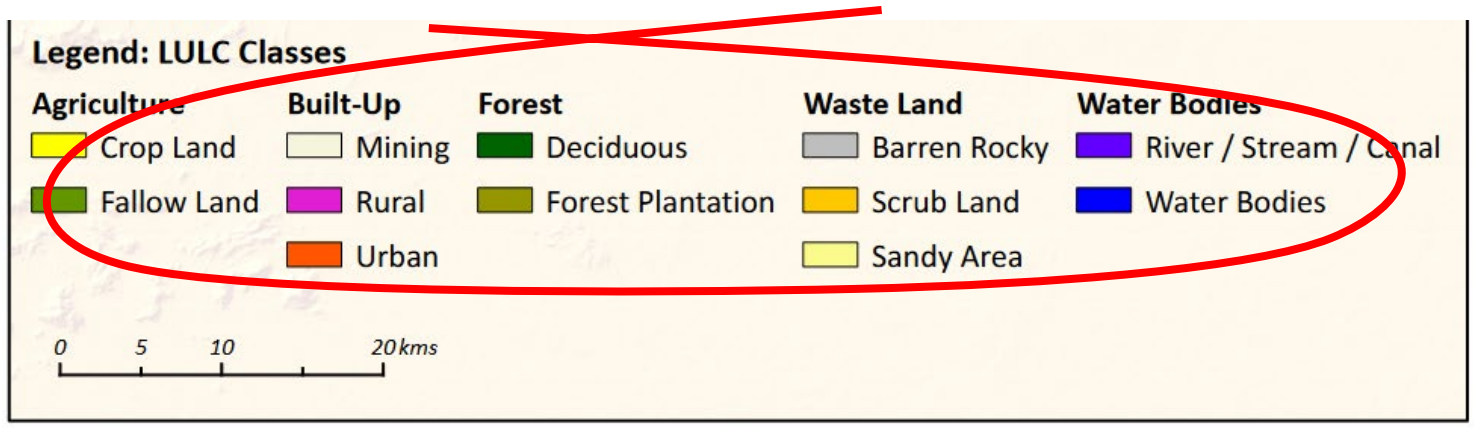

Layer Properties
General
Source
Key Metadata
Extent
Display
Symbology
Fields
Joins & Relates
Show:
Unique Values
Classified
Stretched
Colormap
Discrete Color
Draw raster assigning a color to each value
Value Field
Value
Color Scheme
Symbol
<VALUE>
Label
Count
<all other values>
<all other values>
<Heading>
0
0
2085450
1
1
93875
2
2
245955
3
3
153116
4
4
393
5
5
38770
Add All Values
Add Values...
Remove
Default Colors
Colormap
About symbology
Display NoData as
OK
Cancel
Apply

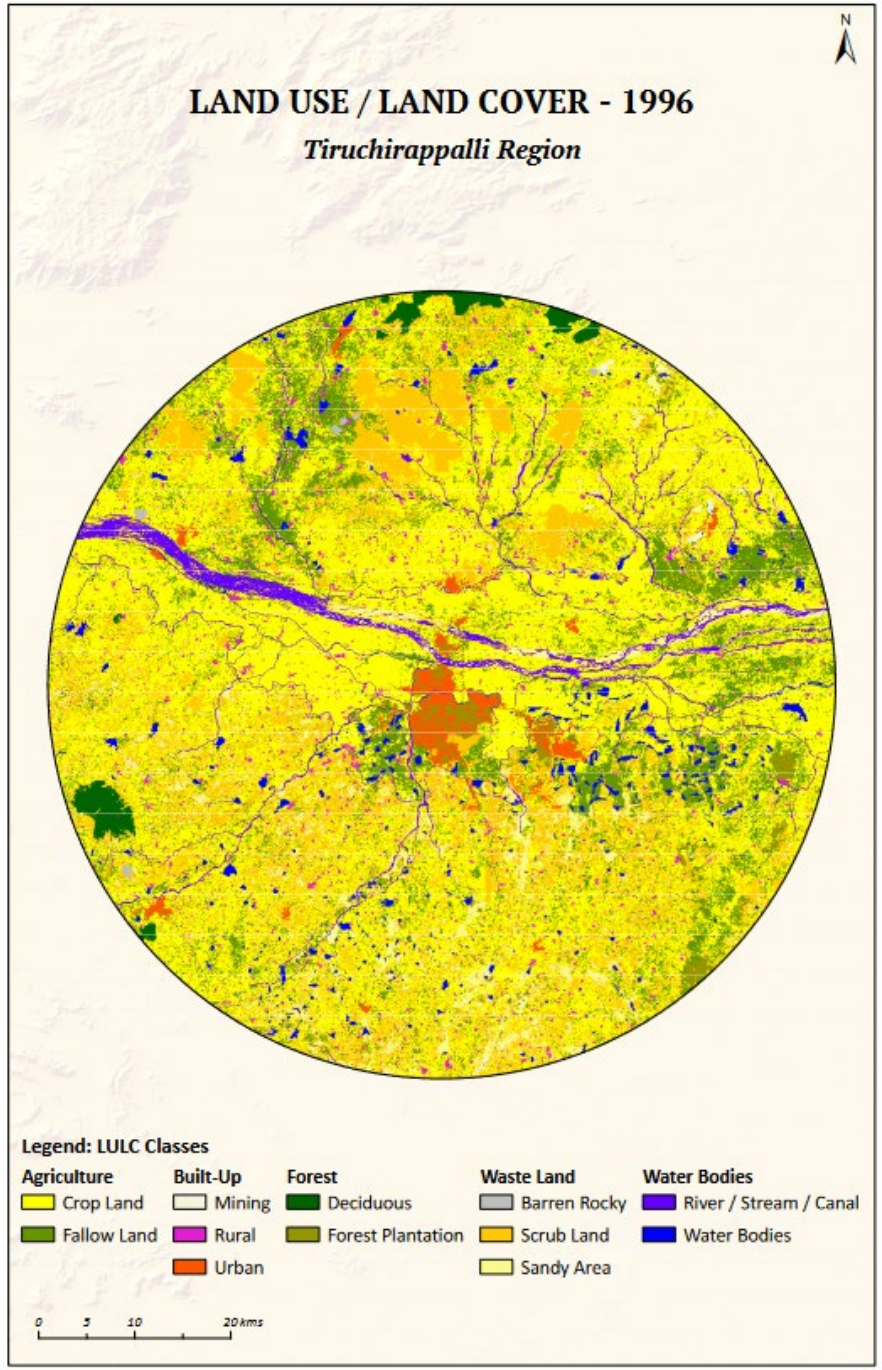
Class Interval



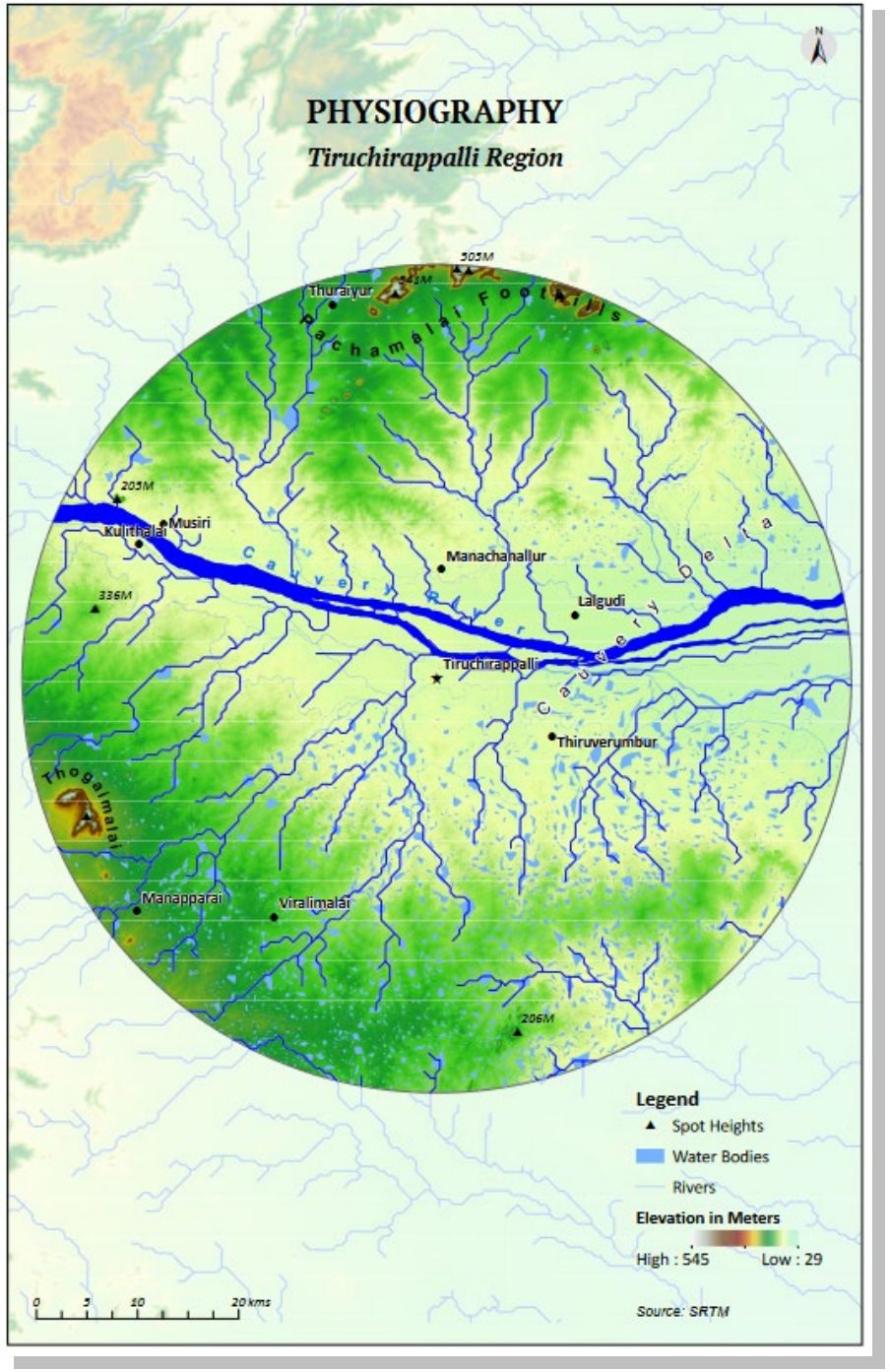


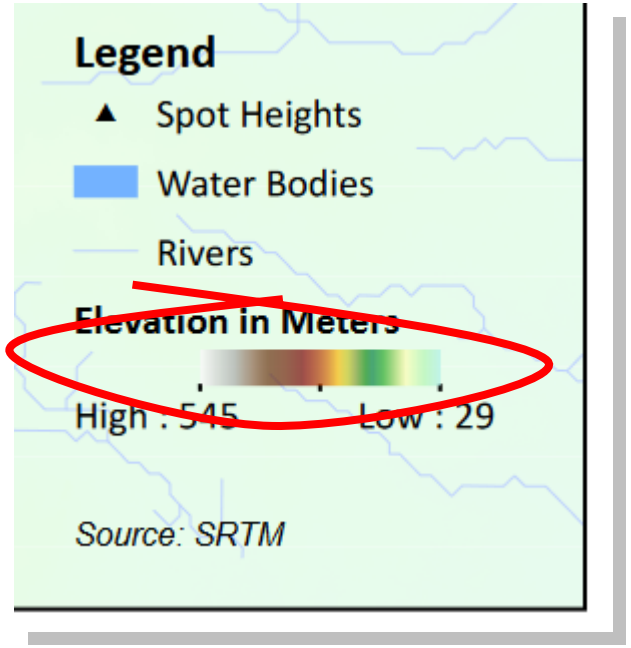
Unique Field





Gradience


PHYSIOGRAPHY
Tiruchirappalli Region
N
505M
Thuraiyur
Pachamalai Foothills
205M
Musiri
Kulithalai
Manachanallur
336M
Lalgudi
Kaveri River Delta
Tiruchirappalli
Thiruverumbur
Thogaimalai
Manapparai
Viralimalai
206M
Legend
Spot Heights
Water Bodies
Rivers
Elevation in Meters
High : 545
Low : 29
Source: SRTM
0
5
10
20 kms


Legend
Spot Heights
Water Bodies
Rivers
Elevation in Meters
High : 545
Low : 29
Source: SRTM

Current Issues and Trend

- How we map?
  - Location tagged data: Phone, Browser, GPS
- Spatial Data Analysis
  - AI & ML, Online tools, Spatial Data Science (Geopandas)
- Internet and map publishment