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Geographic data types

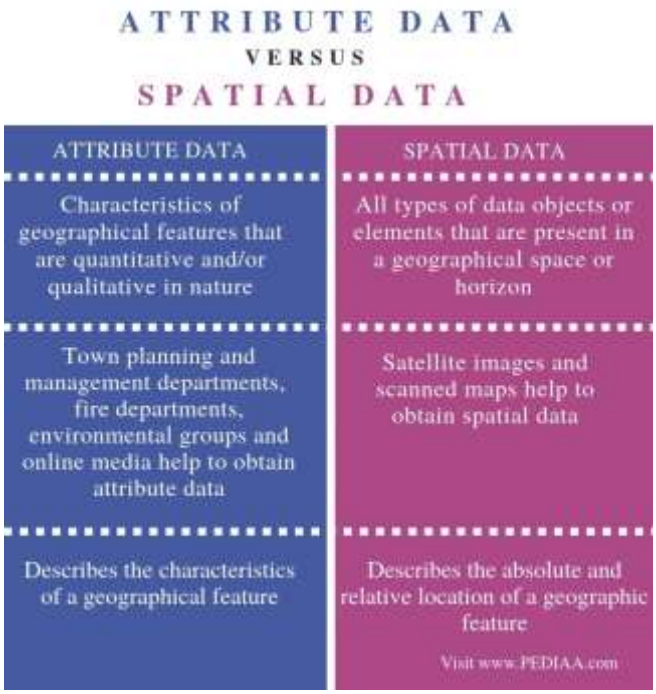
Two kinds of data are usually associated with geographic features:

1. Spatial data

2. Non- spatial or attribute data

Spatial data refers to the shape, size and location of the feature. Spatial data sets are primarily defined as those which are directly or indirectly referenced to a location on the surface of the earth. The spatial data sets, however has primary data type as point, line or polygon and may be referenced to some specific grid system.

Non- spatial data/ attribute data refers to other attributes associated with the feature such as name, length, area, volume, population, soil type, etc. When a dataset cannot be related to a location on the surface of the earth is referred as non spatial data. The non spatial data are numbers, characters or logical type.



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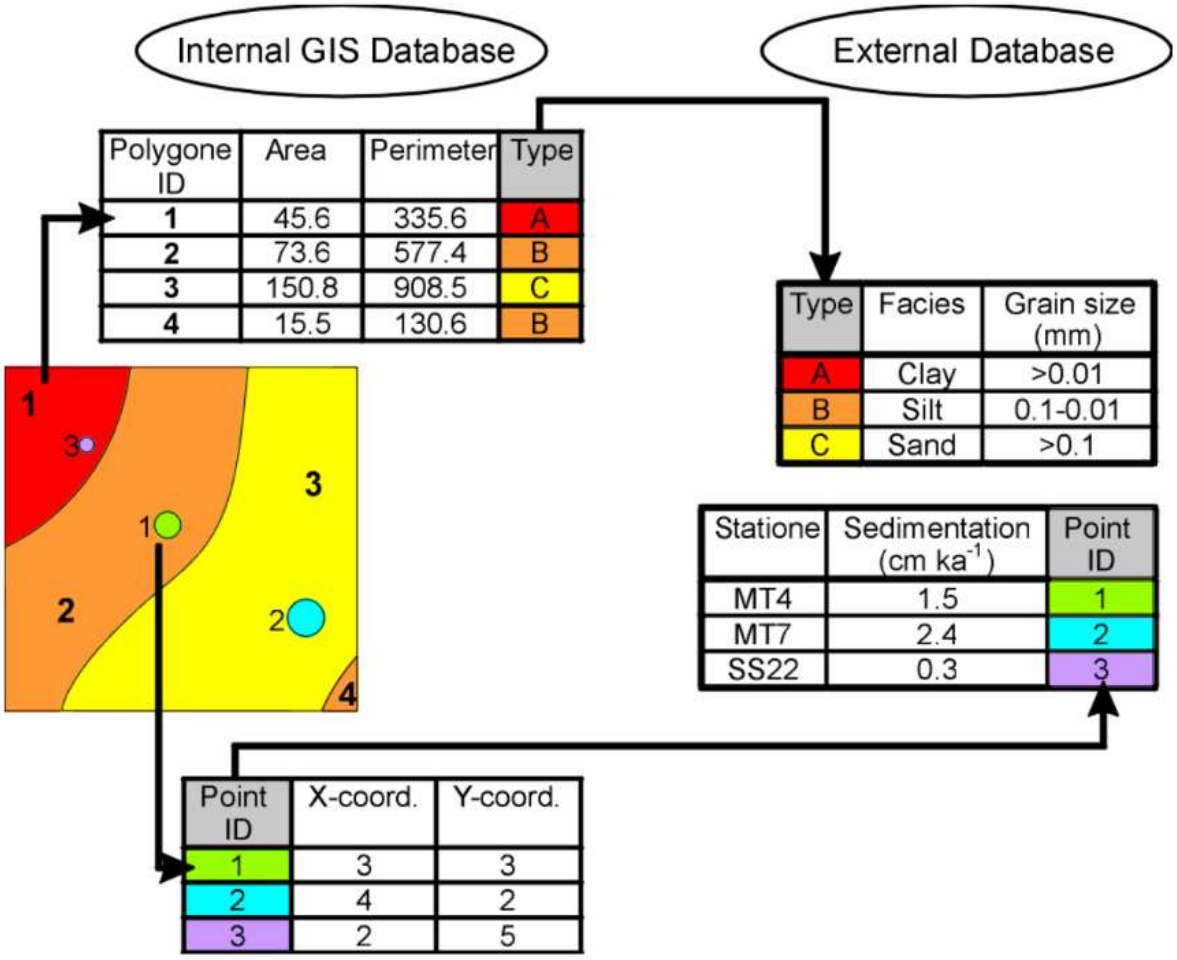

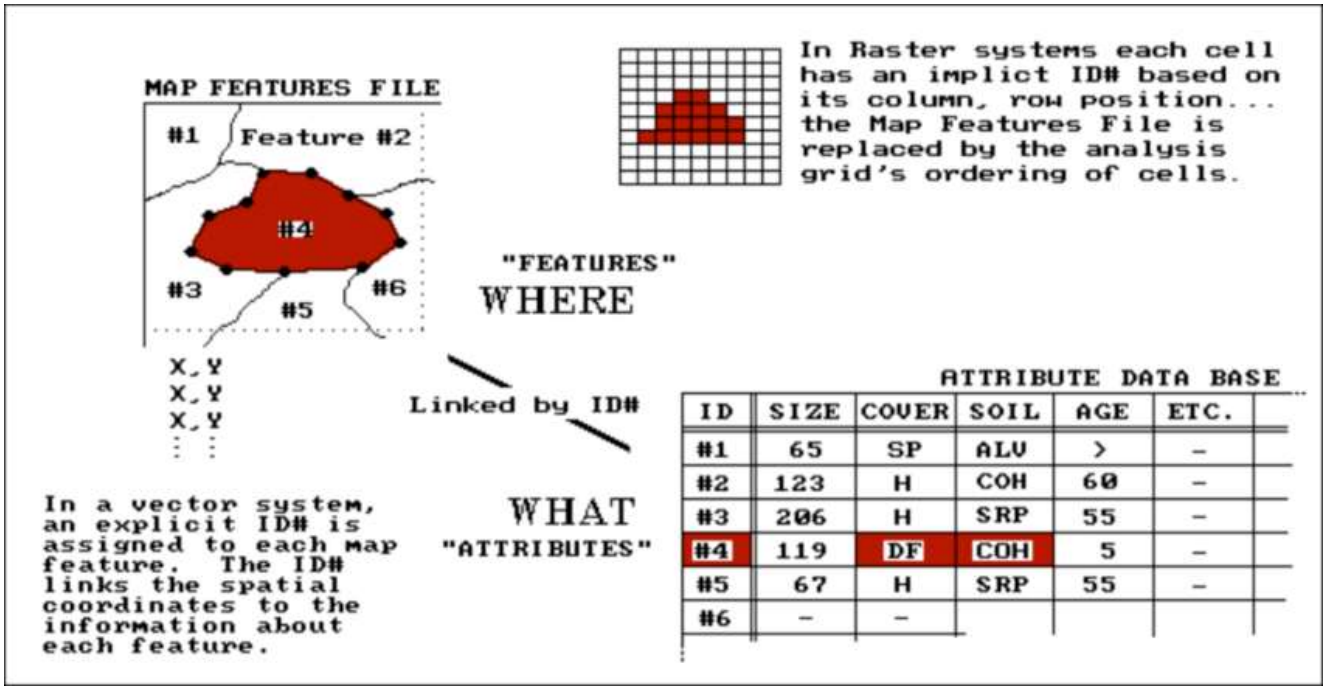

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1. Spatial data: spatially referenced data is represented by **vector and raster** forms (including imagery).

Vector data: In Vector GIS, data can be represented in three forms-

1. Point
2. Line
3. Polygon

1. Point data: Point data is most commonly used to represent nonadjacent features and to represent discrete data points. Points have zero dimensions, therefore you can measure neither length or area with this dataset.

Examples would be schools, points of interest, bridge and culvert locations. Point features are also used to represent abstract points. For instance, point locations could represent city locations or place names.

2. Line Data: Line (or arc) data is used to represent linear features. Common examples would be rivers, trails, and streets. Line features only have one dimension and therefore can only be used to measure length. Line features have a starting and ending point. Common examples would be road centerlines and hydrology.

Symbology most commonly used to distinguish arc features from one another are line types (solid lines versus dashed lines) and combinations using colors and line thicknesses. In the example below roads are distinguished from the stream network by designating the roads as a solid black line and the hydrology a dashed blue line.

3. Polygon data: Polygons are used to represent areas such as the boundary of a city (on a large scale map), lake, or forest. Polygon features are two

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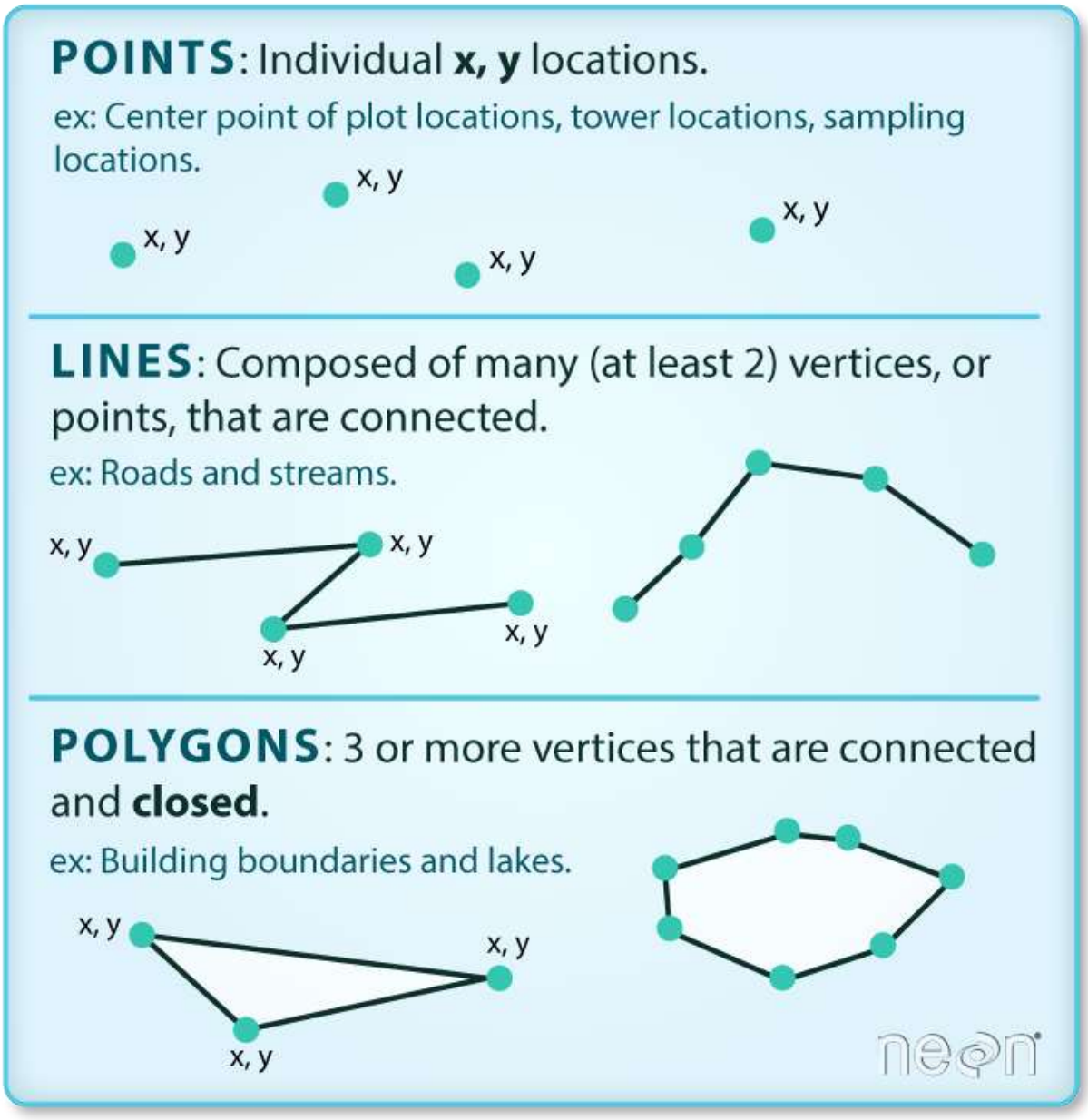
dimensional and therefore can be used to measure the area and perimeter of a geographic feature.

Polygon features are most commonly distinguished using either a thematic mapping symbology (color schemes), patterns, or in the case of numeric gradation, a color gradation scheme could be used.



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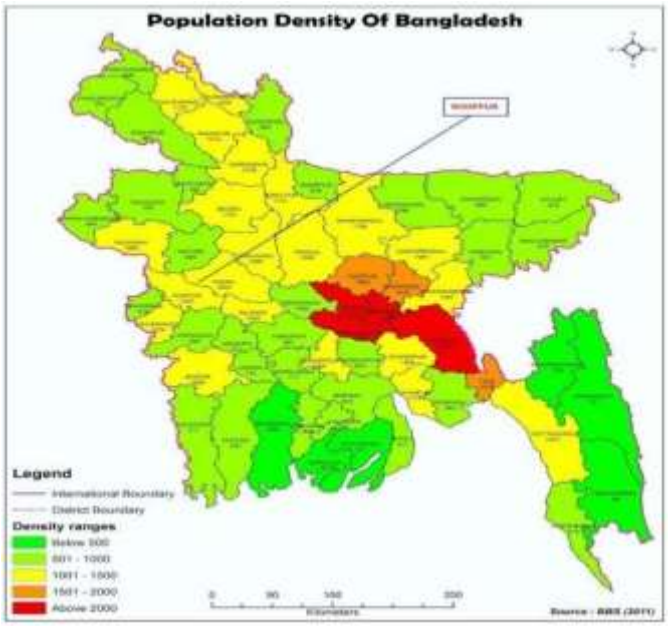
Raster Data: Raster data (also known as grid data) represents the fourth type of feature: surfaces. Raster data is cell-based and this data category also includes aerial and satellite imagery.

Continuous and Discrete Raster Data

There are two types of raster data: continuous and discrete. An example of discrete raster data is population density. Continuous data examples are temperature and elevation measurements. There are also three types of raster datasets: thematic data, spectral data, and pictures (imagery).



A unique reference coordinate represents each pixel either at a corner or the centroid. In turn each cell or pixel has discrete attribute data assigned to it. Raster data resolution is dependent on the pixel or grid size and may vary from sub- meter to many kilometers. Because these data are two-dimensional, GISs store various information such as forest cover, soil type, land use, wetland habitat, or other data in different layers. Layers are functionally related map features. Generally, raster data requires less processing than vector data, but it consumes more computer storage space.

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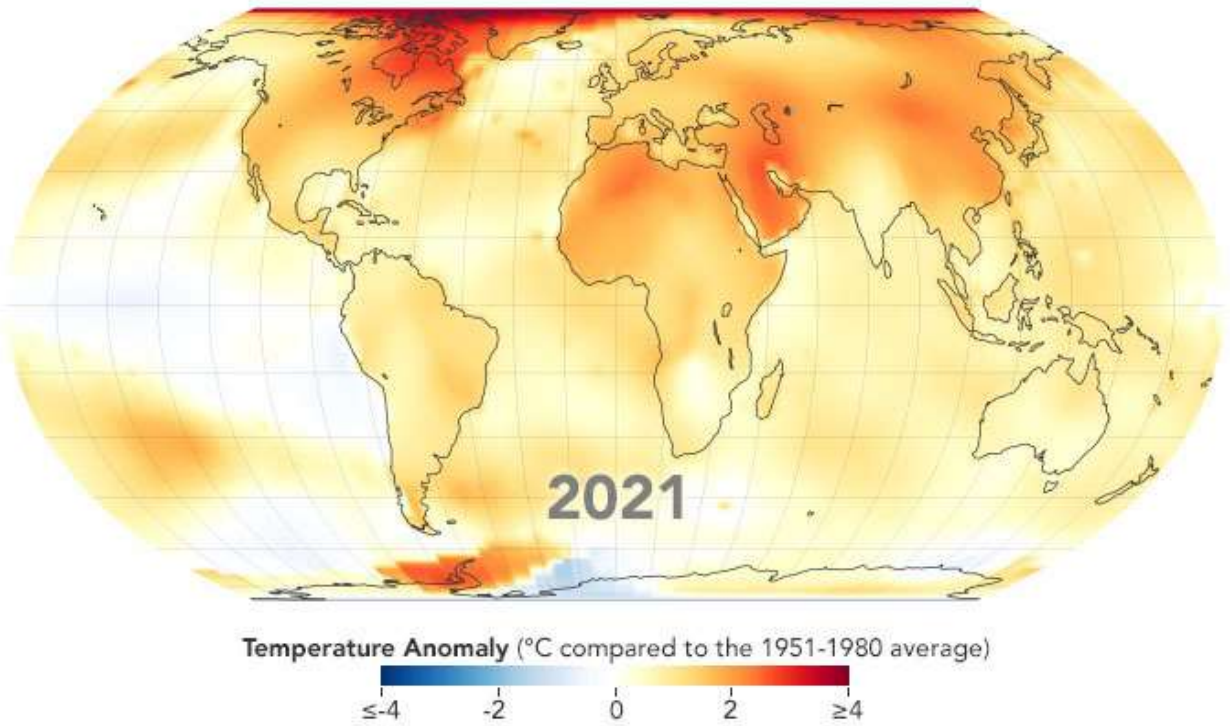
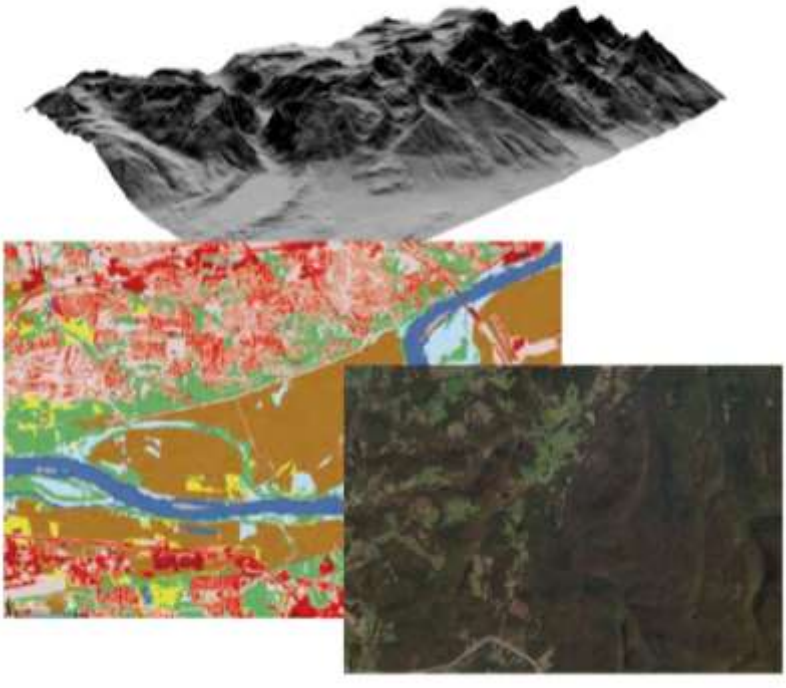


Examples of Raster Data

- Digital Elevation Models
- Land Cover
- Aerial Imagery
- Scanned Maps



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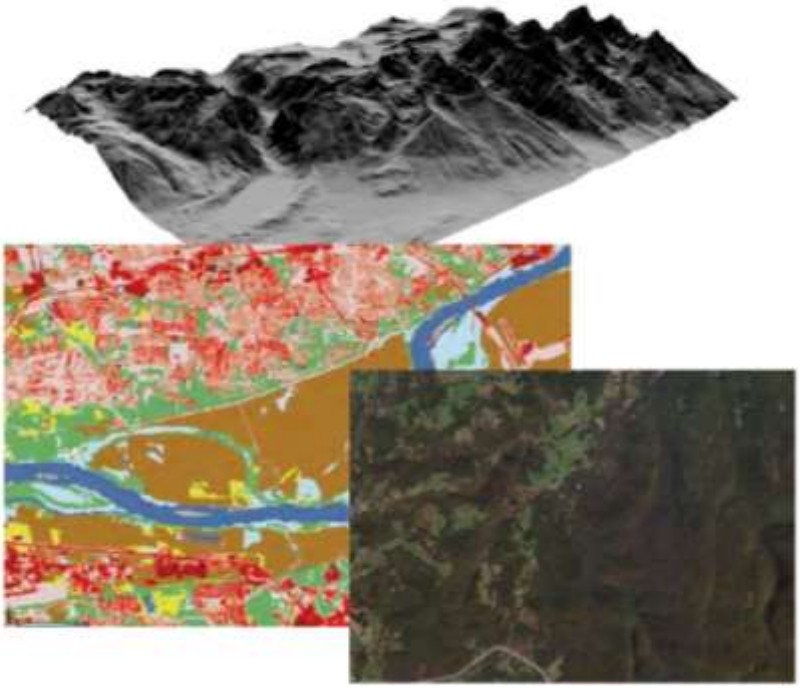
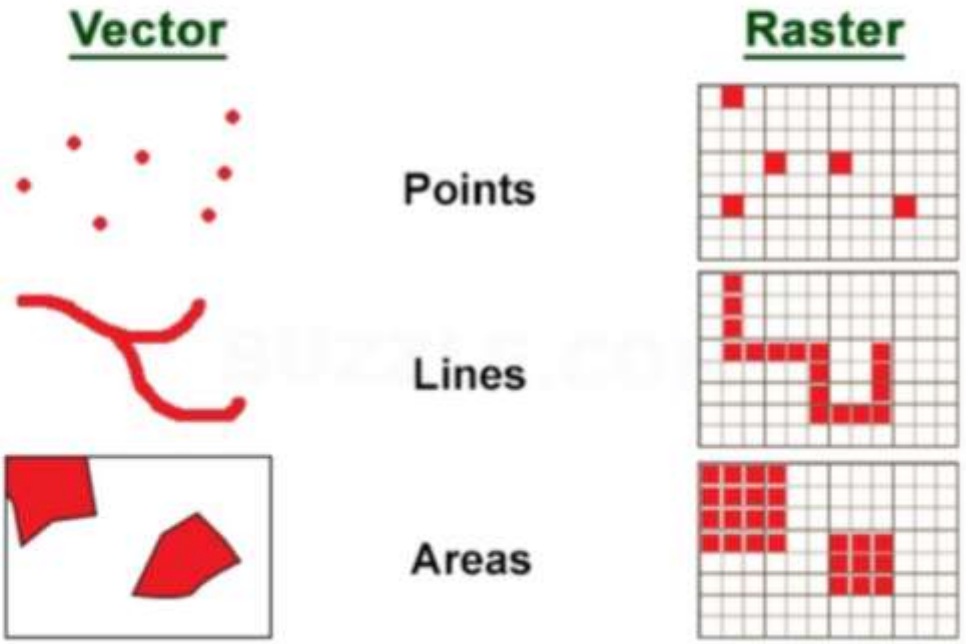
Formats of Raster Data

- TIFF
- JPEG, JPEG2000
- ArcGIS GRID
- Geodatabase Raster
- Many others!



Comparison between vector and raster



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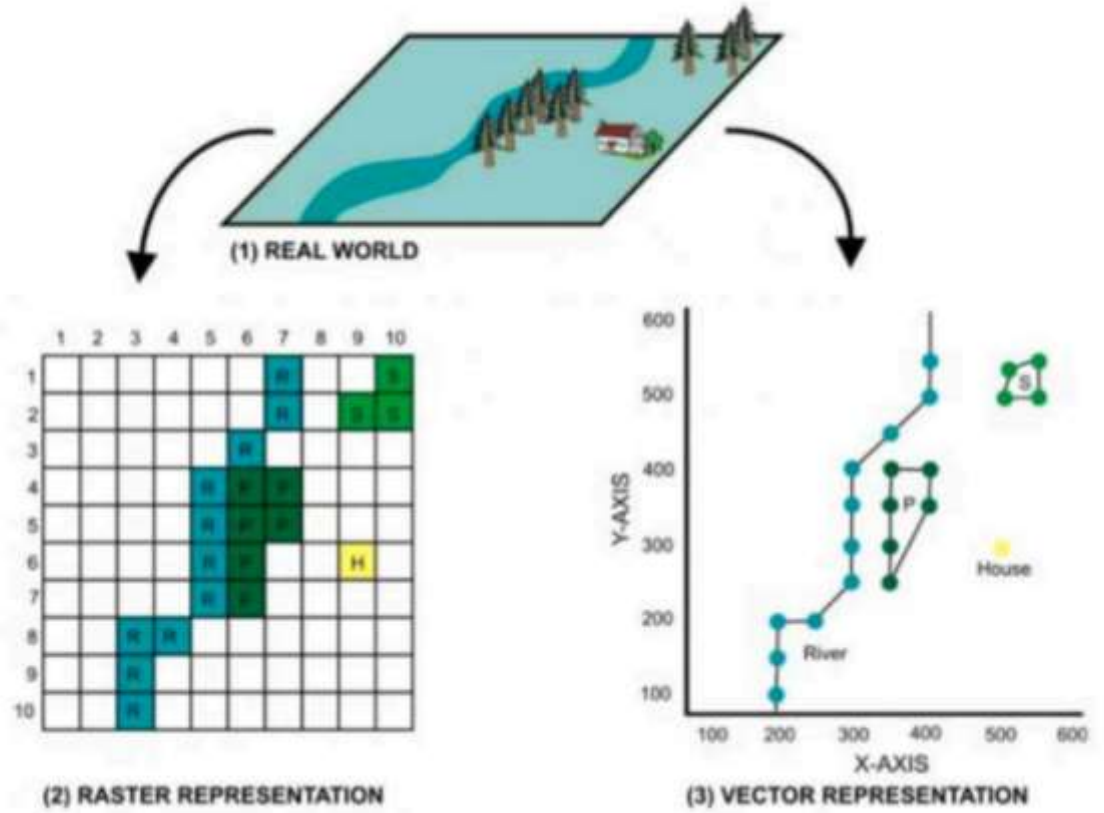

Characteristic	Vector	Raster
Data type	Complex	Simple
Storage requirements	Usually small	Large without compression
Coordinate Conversion	Simple	May be slow due to size of files
Analysis	Best for network analysis Makes many spatial tools more complex	Easier for continuous data (temperature) Good for map combinations
Positional precision	Limited by quality of positional measurements	By cell size (resolution)
Accessibility	Complex	Easy to modify or program because of data structure
Display and Output	Similar to hand drawn maps poor for displaying images Good for displaying roads and rivers	Good for images, but roads or discrete features show box structure

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Data structure	Advantages	Disadvantages
Raster	(a) easy to produce (b) easy workflow and analysis (c) represents continuous features	(a) hard to represent objects less than cell size (b) finer resolution generates huge data (c) highly generalized representation of discrete features (d) limited interactivity and more primitive analysis algorithm
Vector	(a) simple discrete geometry that means less data (b) easy to edit (c) logical data structure (d) attributes are combined with objects (e) preserve source extent or scale after utilizing different rule and (f) many types of geographical analysis techniques supported	(a) Spatial analysis, filtering or any change inside a single polygon or line is not possible (b) continuous data is difficult to represent (c) lots of manual editing may be necessary (d) uncertainty modeling is difficult