Introduction to ArcGIS Online

Research Computing Services

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https://github.com/milechin/buspark_gis

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Field Work

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Schedule

- Brief overview on GIS theory
- **Break**
- Overview of ArcGIS Online
- **Break**
- Hands-On Activity

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Lecture Outline

- What is GIS?
- How is GIS/Mapping Useful?
- Geographic Coordinate System
- Spatial Data Models
- Projections

What is GIS?

- **Geographic Information System**

  "A **geographic information system** (**GIS**) consists of integrated computer hardware and software that store, manage, analyze, edit, output, and visualize geographic data. Much of this often happens within a spatial database, however, this is not essential to meet the definition of a GIS. In a broader sense, one may consider such a system also to include human users and support staff, procedures and workflows, the body of knowledge of relevant concepts and methods, and institutional organizations."

https://en.wikipedia.org/wiki/Geographic_information_system

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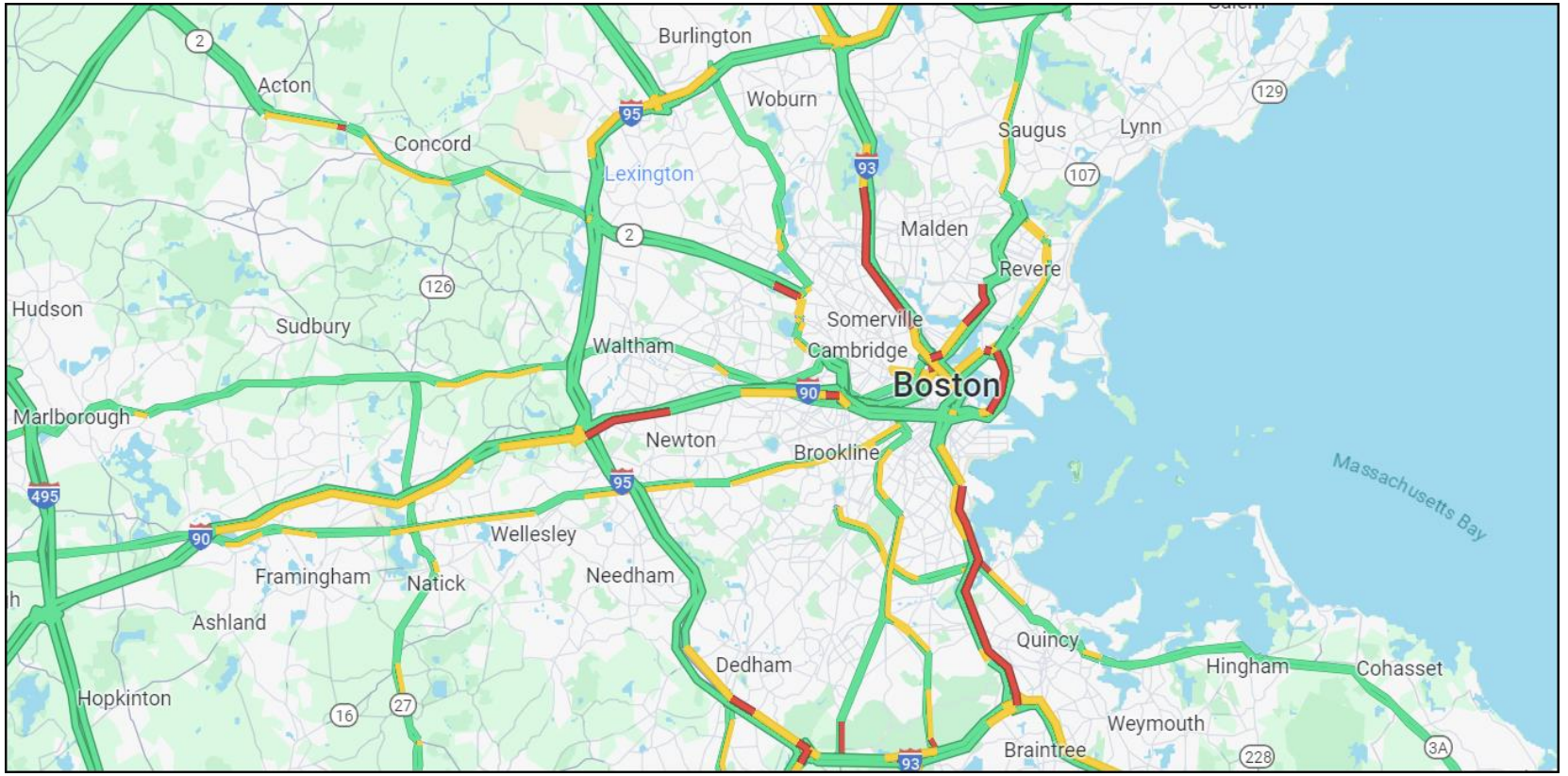
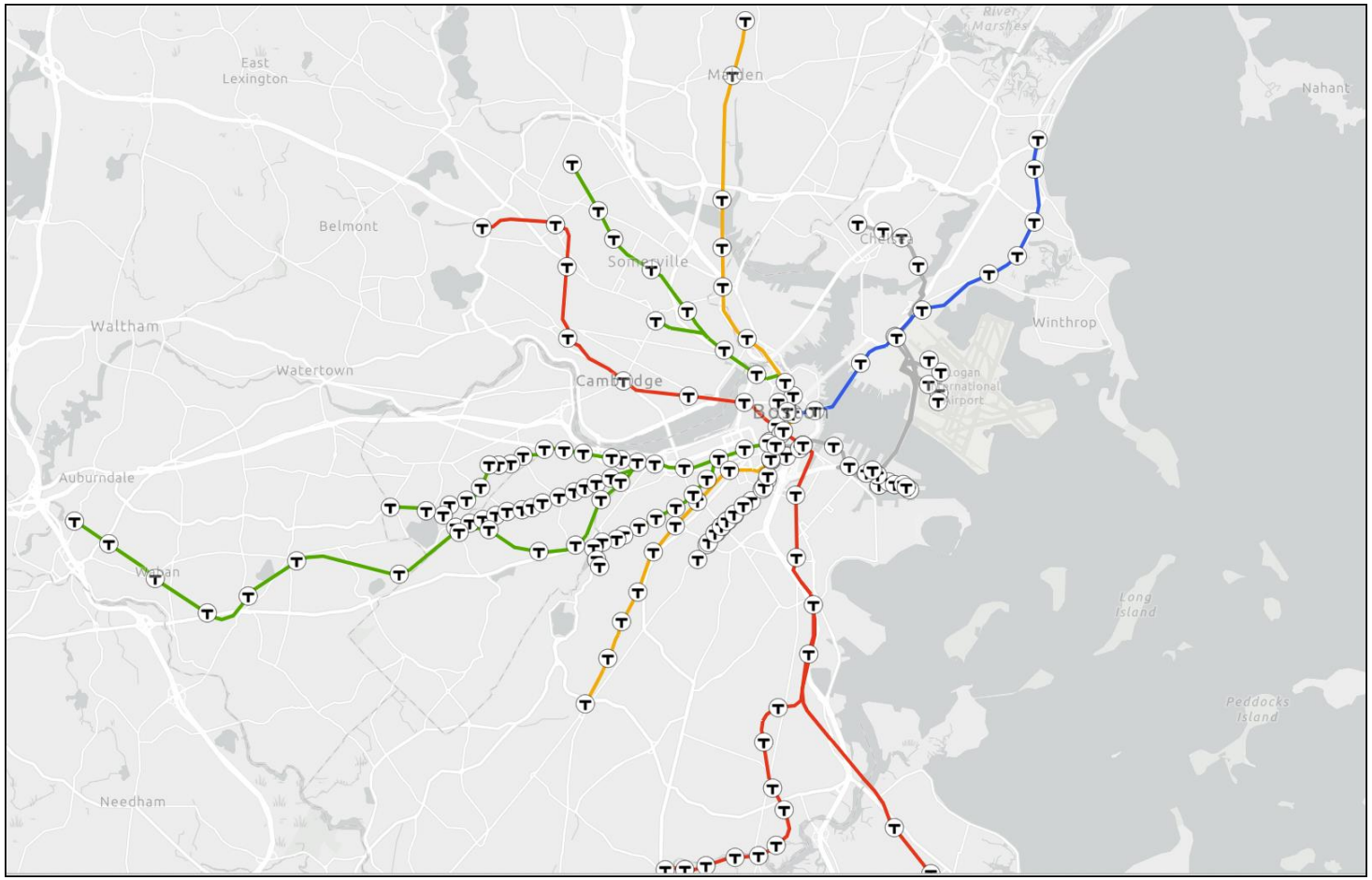
How is GIS/Mapping Useful?

How is GIS/Mapping Useful?



Source: google.com/maps

How is GIS/Mapping Useful?



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How is GIS/Mapping Useful?

E. W. Gilbert's version (1958) of John Snow's 1855 map of the Soho cholera outbreak showing the clusters of cholera cases in the London epidemic of 1854.

Source: https://en.wikipedia.org/wiki/Geographic_information_system

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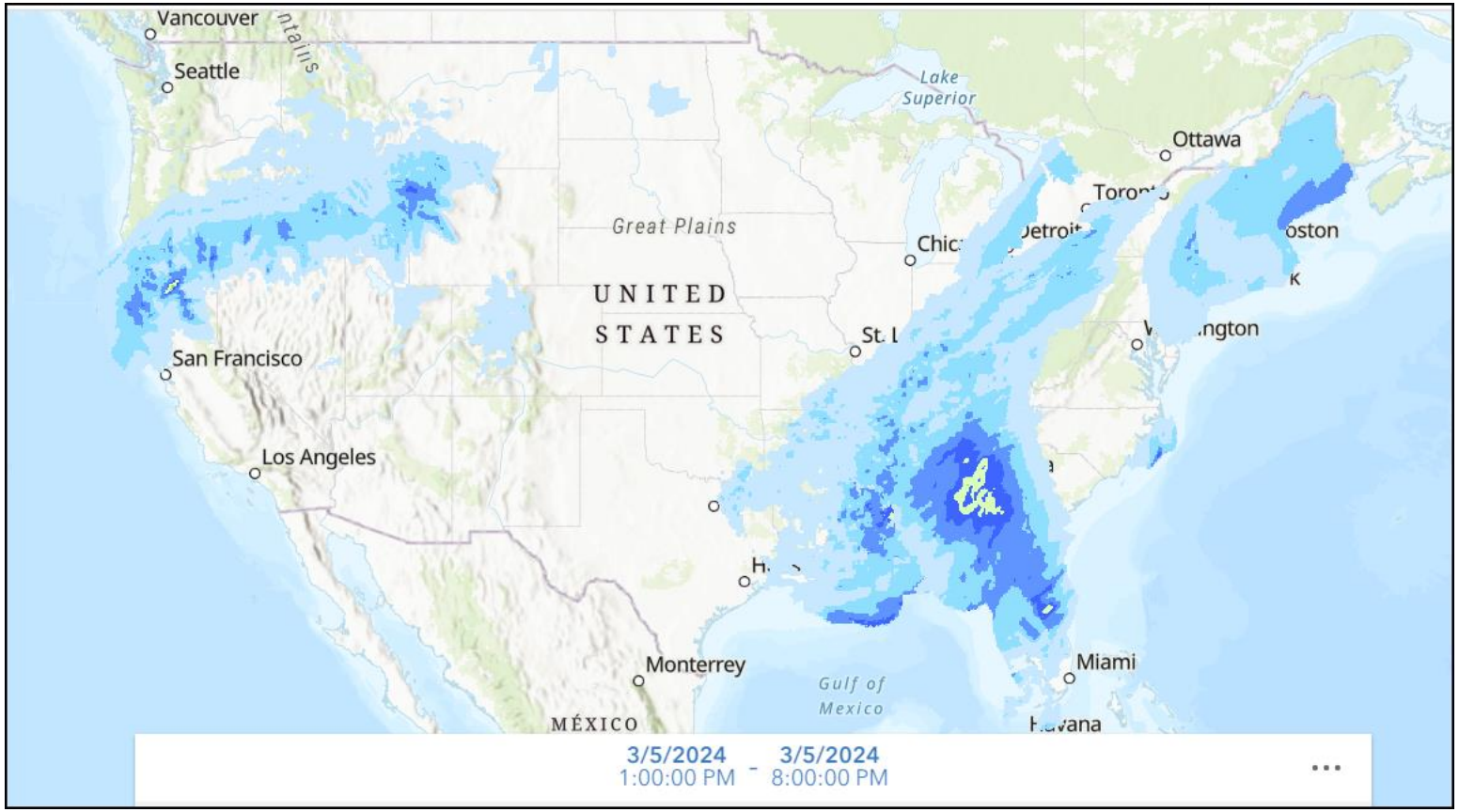
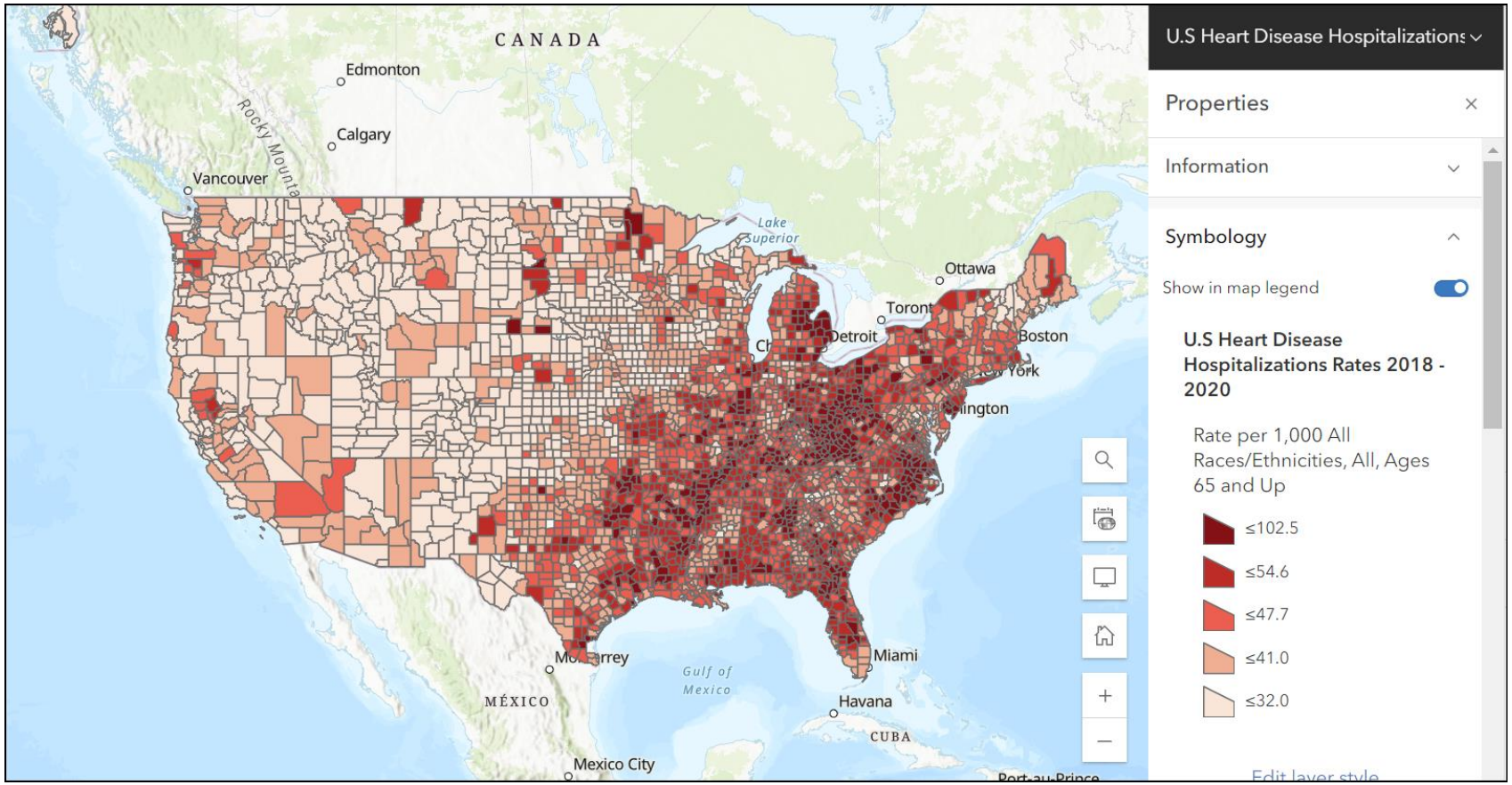
How is GIS/Mapping Useful?



National Weather Service Precipitation Forecast

Source: https://bucas.maps.arcgis.com/home/item.html?id=f9e9283b9c9741d09aad633f68758bf6

How is GIS/Mapping Useful?



U.S Heart Disease Hospitalizations Rates 2018 – 2020

Source: https://bucas.maps.arcgis.com/home/item.html?id=373d891006a547a6b94b30fe3c897be5

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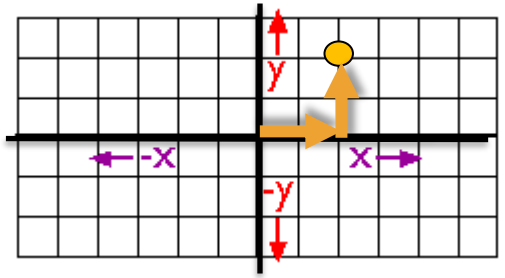
Geographic Coordinate System

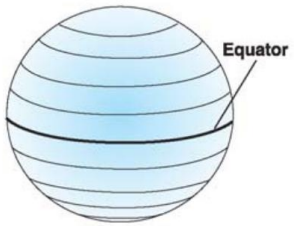
Cartesian Coordinate System



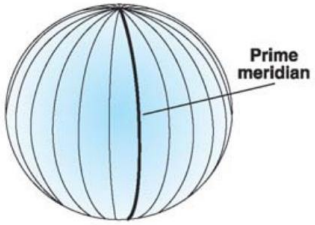
Point (2,2)

Source: https://www.e-education.psu.edu/natureofgeoinfo/c2_p10.html

GCS



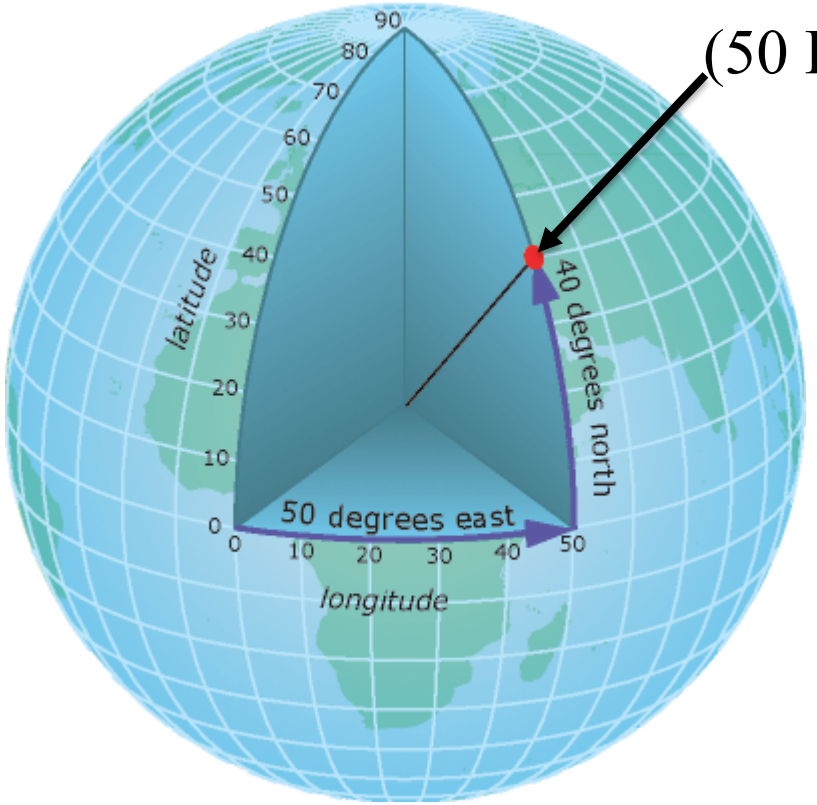
Parallels
(Lines of latitude)

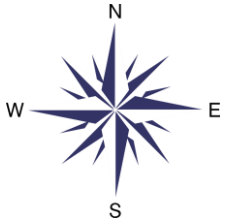


Meridians
(Lines of longitude)

Graticular
Network

Source: http://desktop.arcgis.com/en/arcmap/10.3/guide-books/map-projections/about-geographic-coordinate-systems.htm





Source: http://desktop.arcgis.com/en/arcmap/10.3/guide-books/map-projections/geographic-coordinate-system.htm

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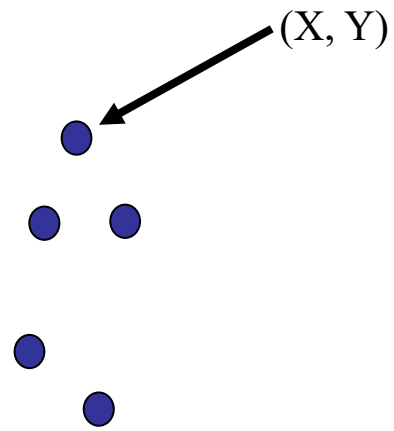
Common Spatial Data Models

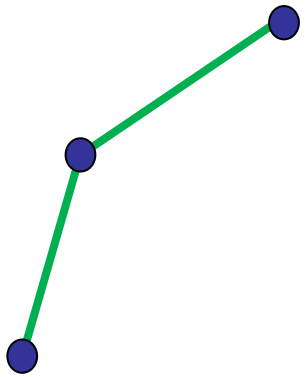
Vector

Raster

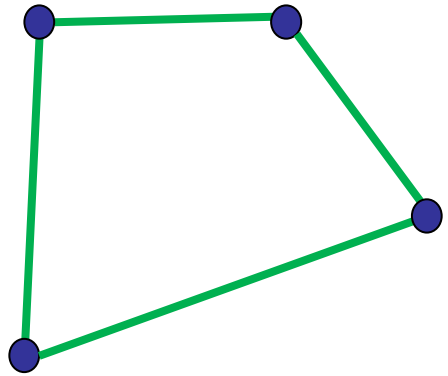
Common Spatial Data Models - Vector



Points



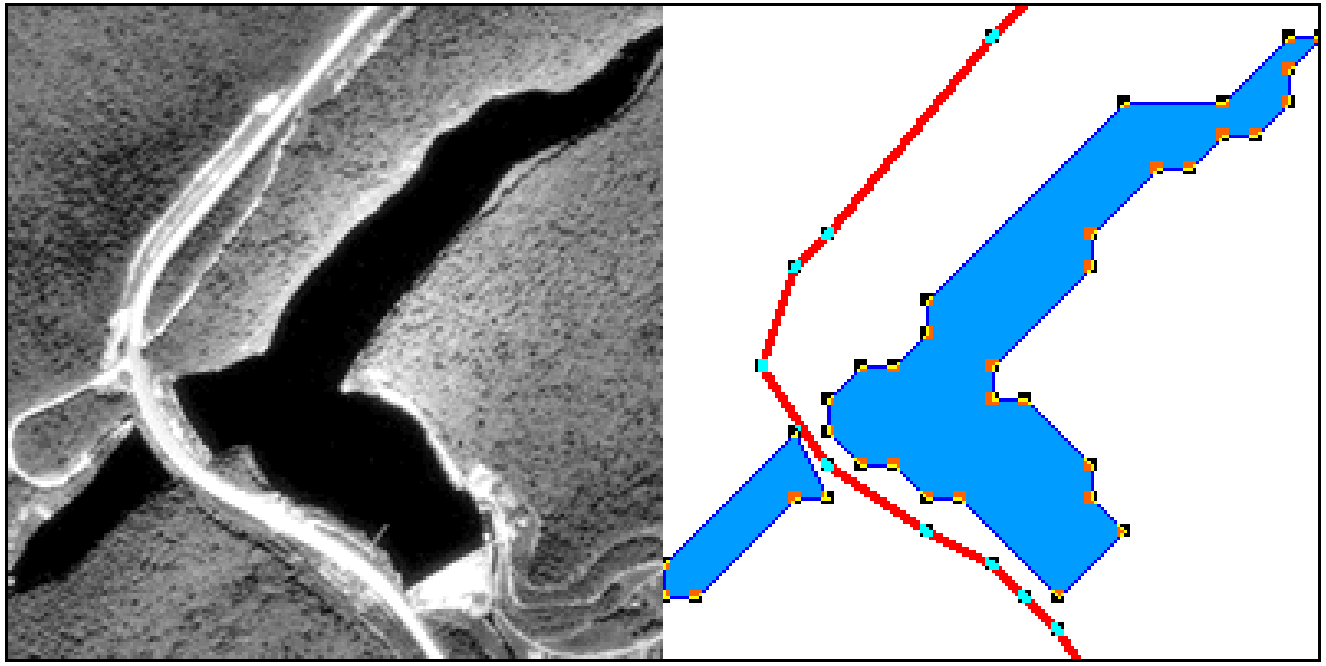
Polylines



Polygon

Note: Each type of vector data is put in its own group, layer, when stored in a data file.

Common Spatial Data Models - Vector



Source and Additional Reading:
https://www.e-education.psu.edu/natureofgeoinfo/c1_p9.html

Common Spatial Data Models - Vector

Demo

Common Spatial Data Models

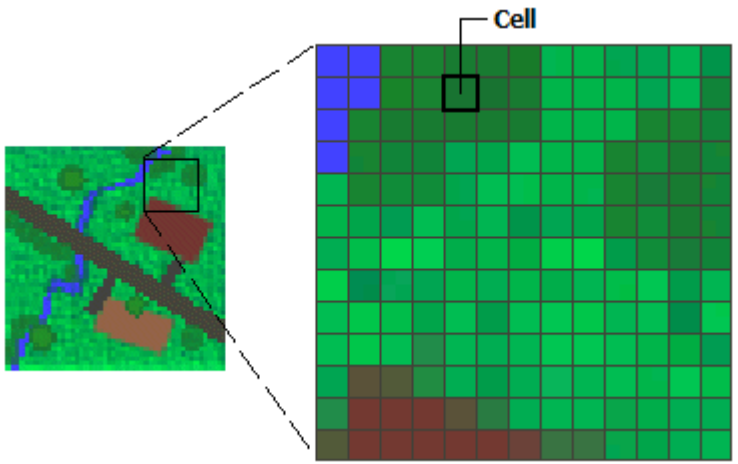
Vector

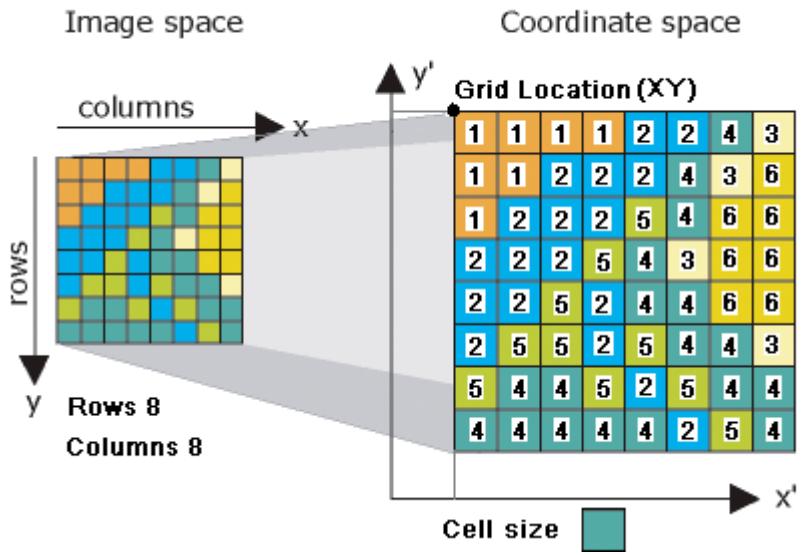
Raster

Common Spatial Data Models - Raster

Raster Data

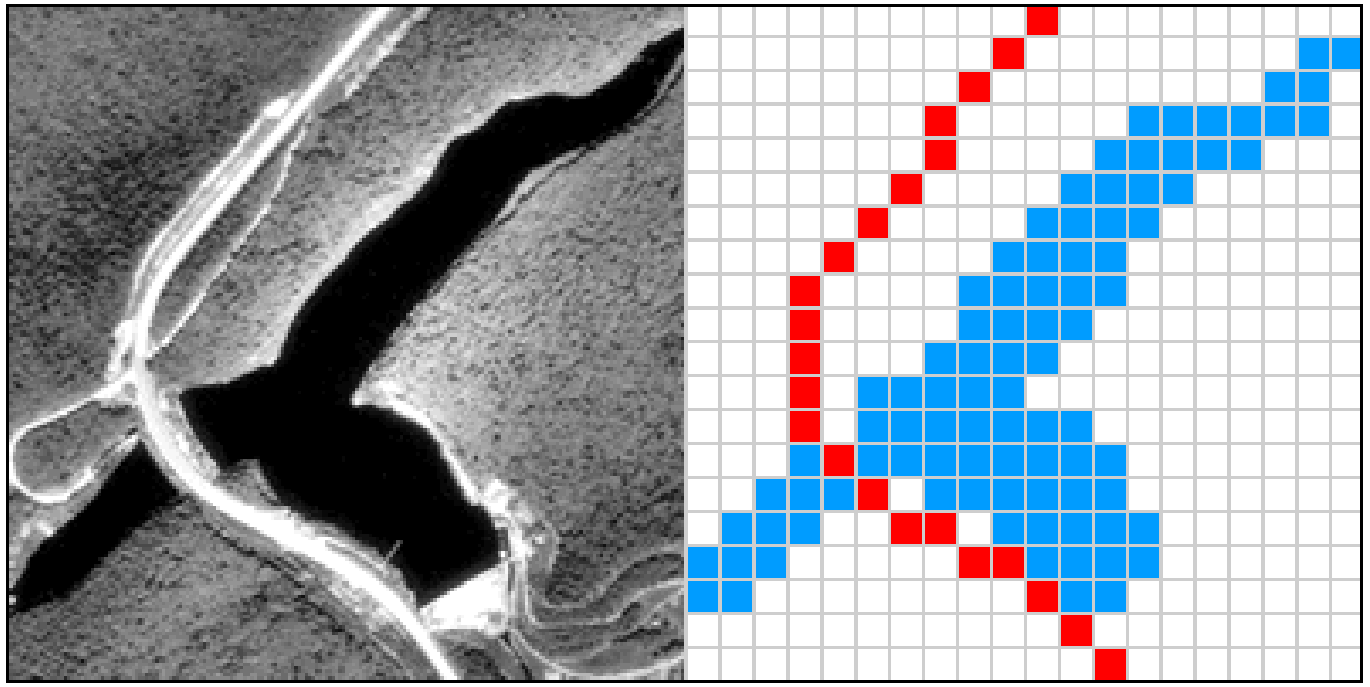
- continuous data
- uniform gridded data





Source: http://desktop.arcgis.com/en/arcmap/latest/manage-data/raster-and-images/what-is-raster-data.htm

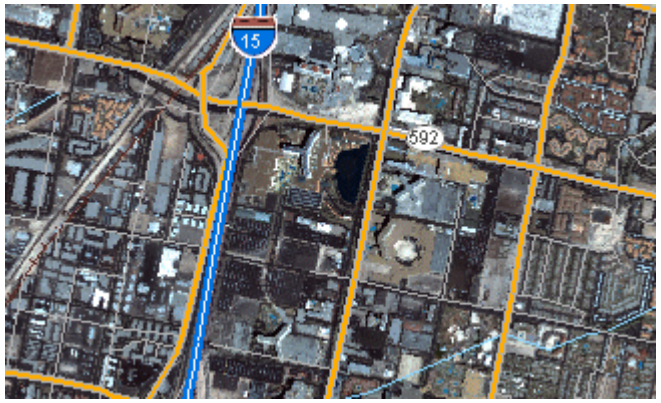
Common Spatial Data Models - Raster

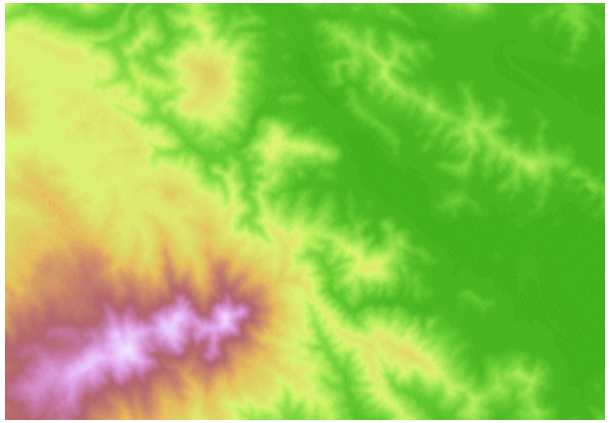


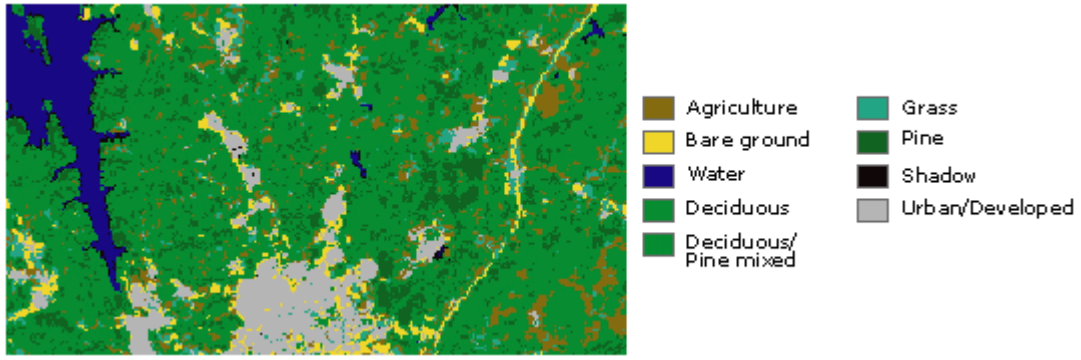
Source and Additional Reading:
https://www.e-education.psu.edu/natureofgeoinfo/c1_p9.html

Common Spatial Data Models - Raster

Examples of Raster Data







Source: http://desktop.arcgis.com/en/arcmap/latest/manage-data/raster-and-images/what-is-raster-data.htm

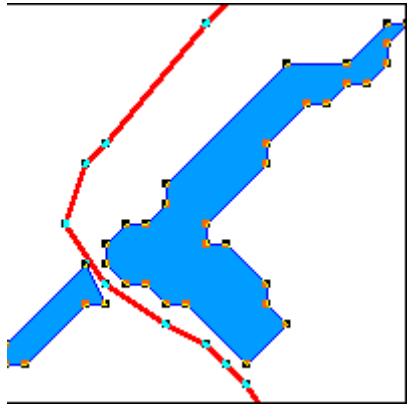
Common Spatial Data Models - Raster

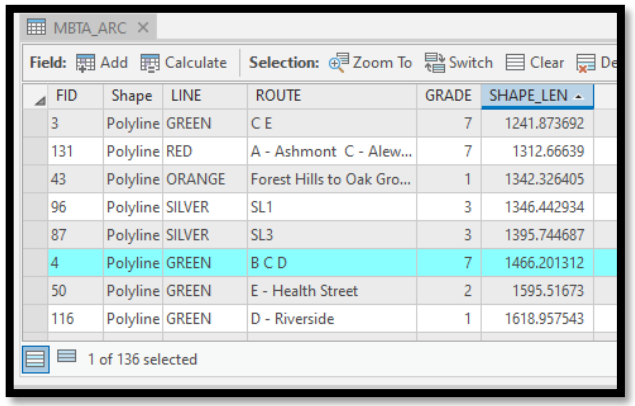
ArcGIS Pro Demo

https://oceancolor.gsfc.nasa.gov/about/projects/cyan/

Common Spatial Data Models - Review

Vector

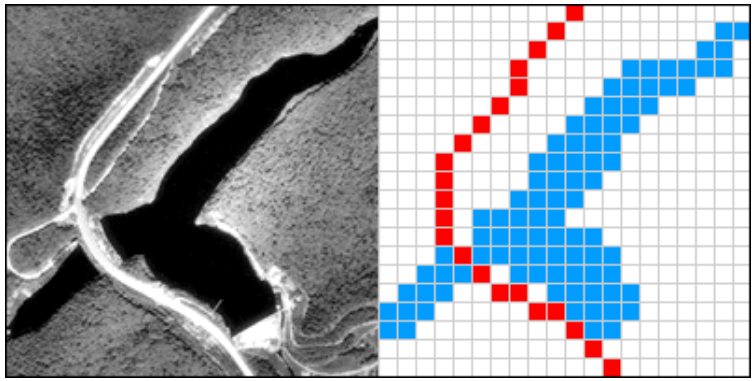




FID	Shape	LINE	ROUTE	GRADE	SHAPE_LEN
3	Polyline	GREEN	C E	7	1241.873692
131	Polyline	RED	A - Ashmont C - Alew...	7	1312.66639
43	Polyline	ORANGE	Forest Hills to Oak Gro...	1	1342.326405
96	Polyline	SILVER	SL1	3	1346.442934
87	Polyline	SILVER	SL3	3	1395.744687
4	Polyline	GREEN	B C D	7	1466.201312
50	Polyline	GREEN	E - Health Street	2	1595.51673
116	Polyline	GREEN	D - Riverside	1	1618.957543

- Attribute Table
  - Labeling
  - Filtering
  - Symbology
  - Grouping

Raster



- Continuous data
- Color coding by cell, by numeric value

Projections

What is wrong with this map?

Country	Area (mi ^2)
Africa	11,730,000
Antarctica	5,405,000
Greenland	836,300

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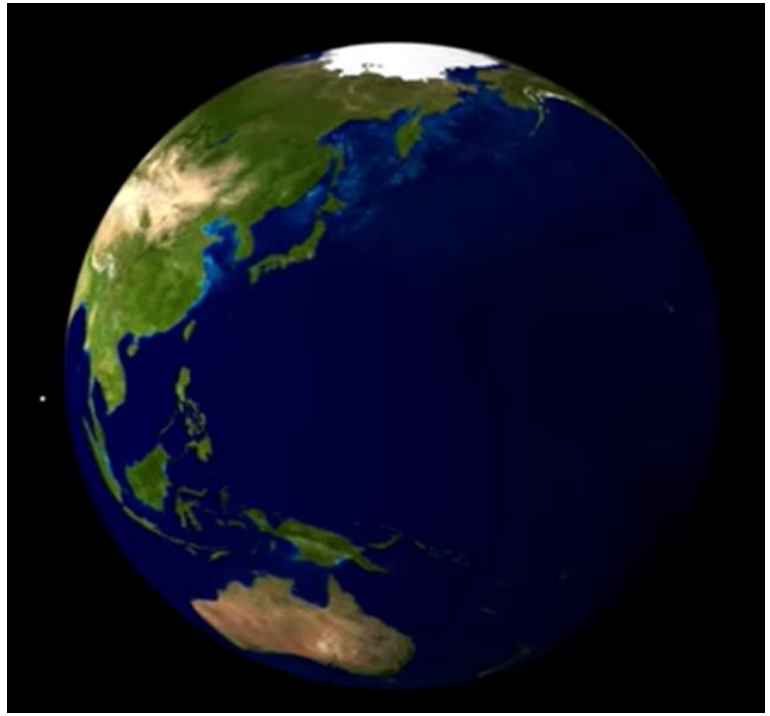
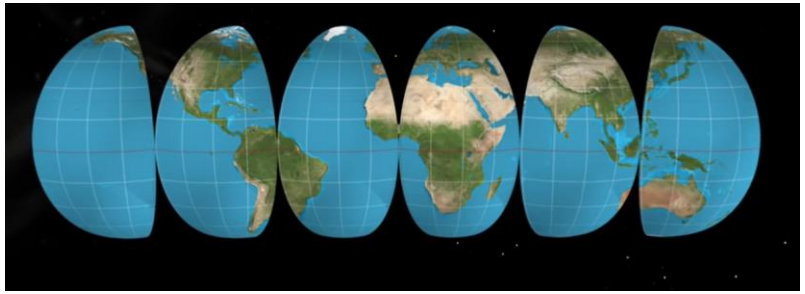
Projections





Source: https://www.youtube.com/watch?v=CPQZ7NcQ6YQ
Additional Reading:
https://laughingsquid.com/world-mercator-projection-map-country-size/

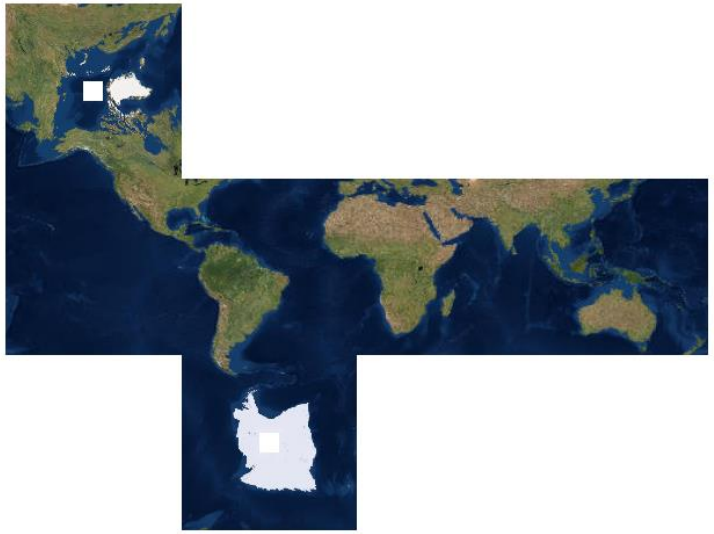
Projections

- Allow creation of flat maps.

- At expense of distorting:
    - Shape
    - Area
    - Direction
    - Distance

Projections

World Fuller



Cube World

Polar NSIDC EASE Grid North

NAD 1983 UTM Zone 15N

Break