Introduction to ArcGIS Online

Research Computing Services

March. 6, 2024

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https://github.com/milechin/buspark_gis

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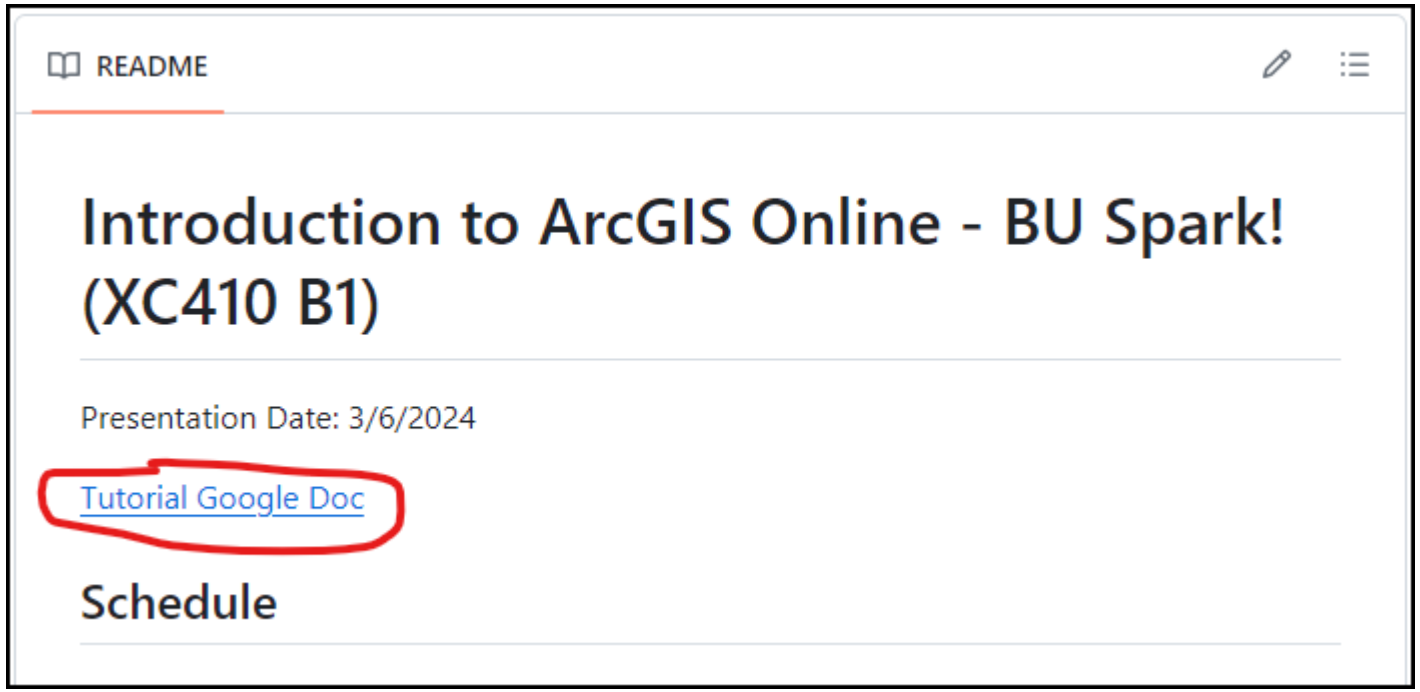
About Me

- Dennis Milechin (help@scc.bu.edu)
  - Research Computing Services
  - 5 years at BU - Scientific Programmer/Analyst
  - 7 years in consulting – Environmental Engineer

About You

- https://github.com/milechin/buspark_gis



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Schedule

- Brief overview on GIS theory
- **Break 1**
- Overview of ArcGIS Online
- **Break 2**
- Hands-On Activity

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•Brief overview on GIS theory - 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."

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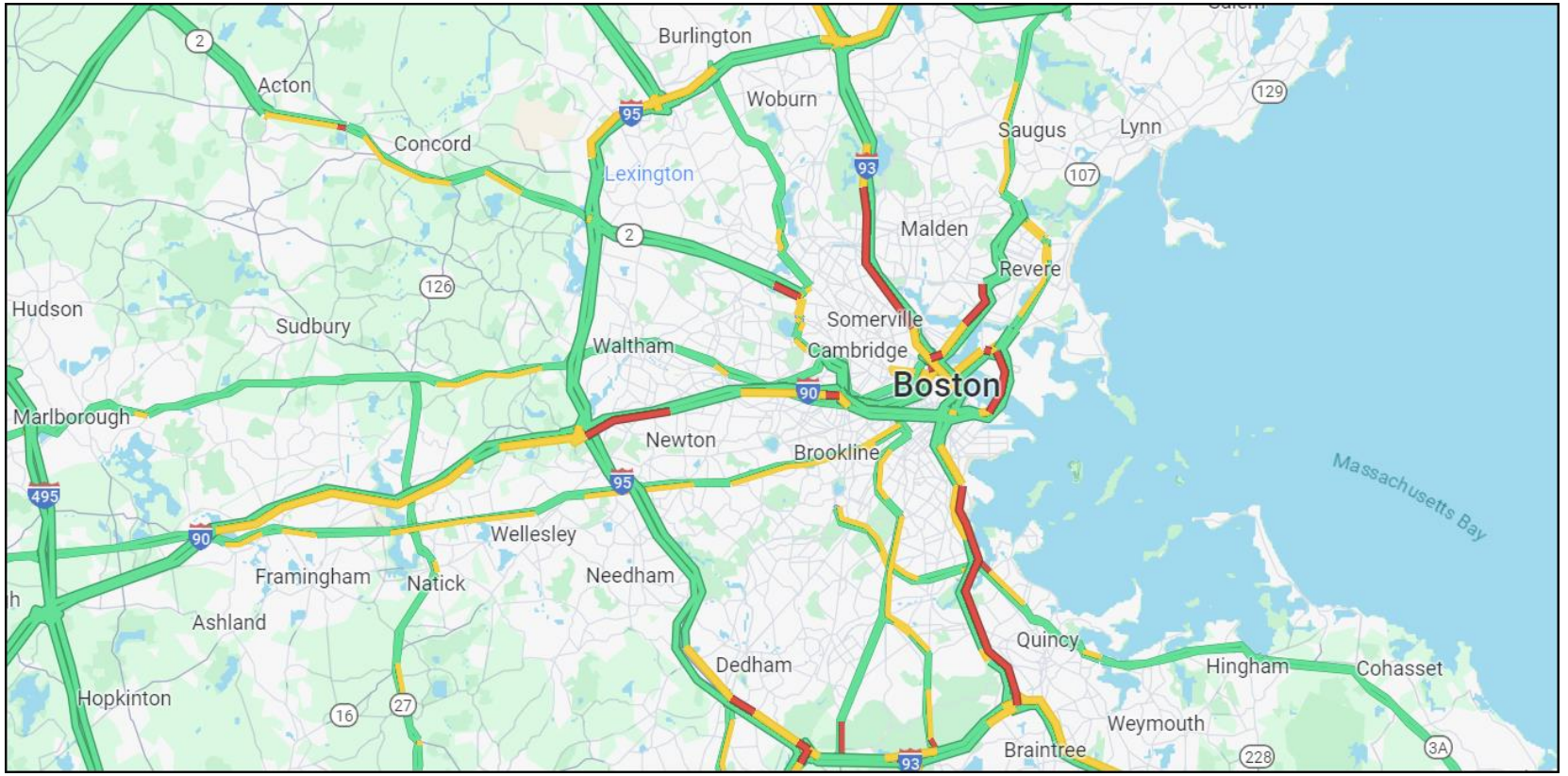
Source: https://en.wikipedia.org/wiki/Geographic_information_system

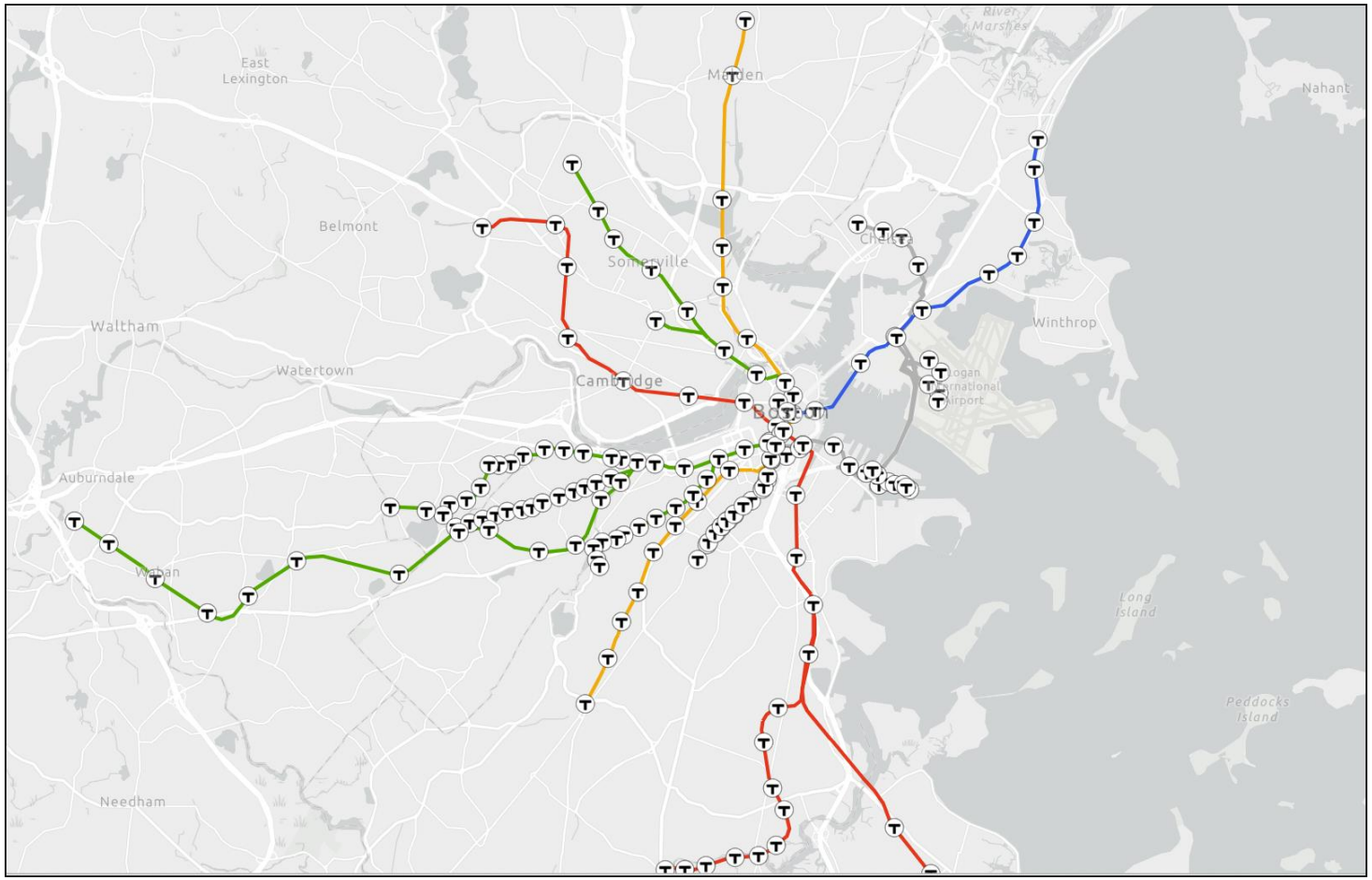
How is GIS/Mapping Useful?

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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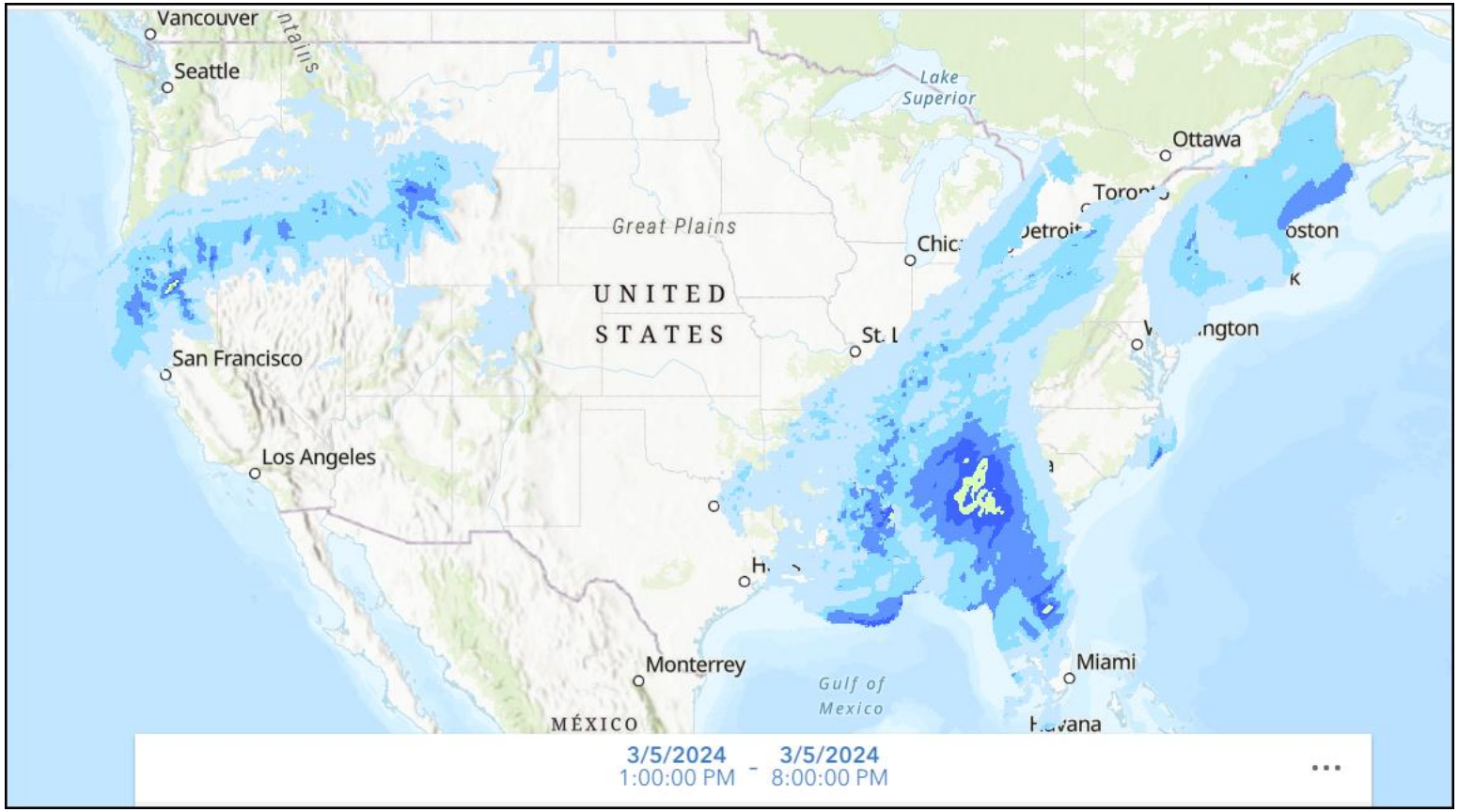
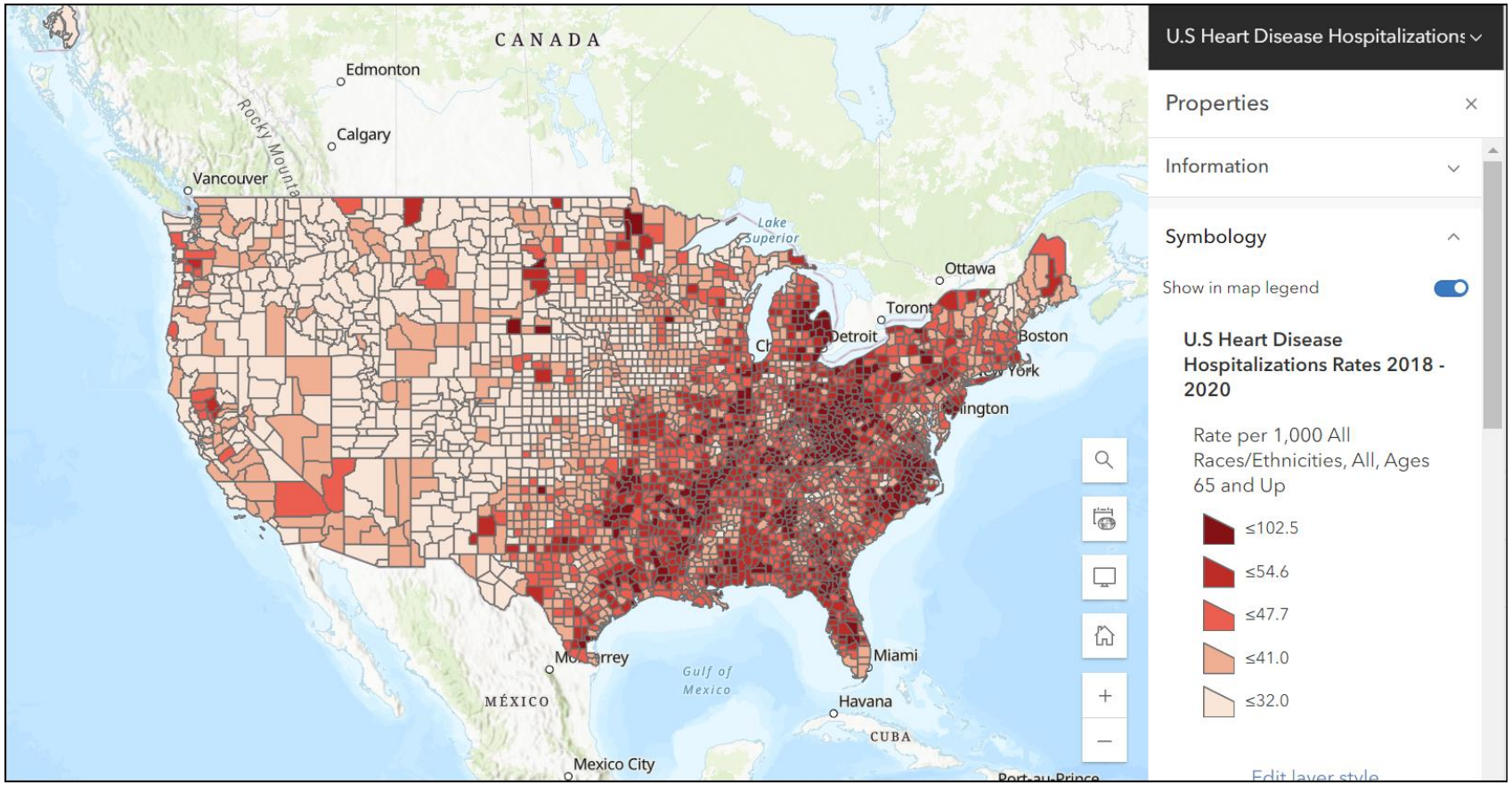
How is GIS/Mapping Useful?



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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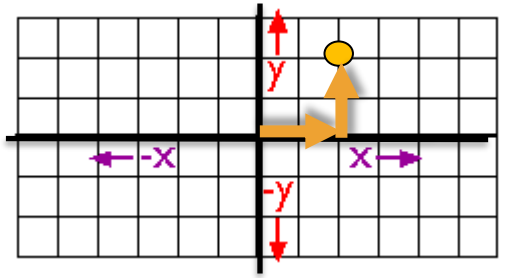
Can GIS/Mapping be useful for your project?

- Answer in Tutorial Google Doc
- https://github.com/milechin/buspark_gis

Geographic Coordinate System

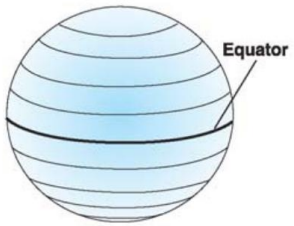
Cartesian Coordinate System

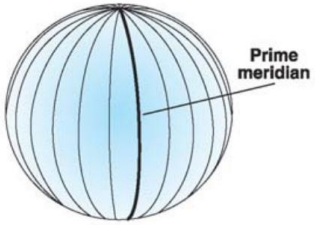


Point (2,2)

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

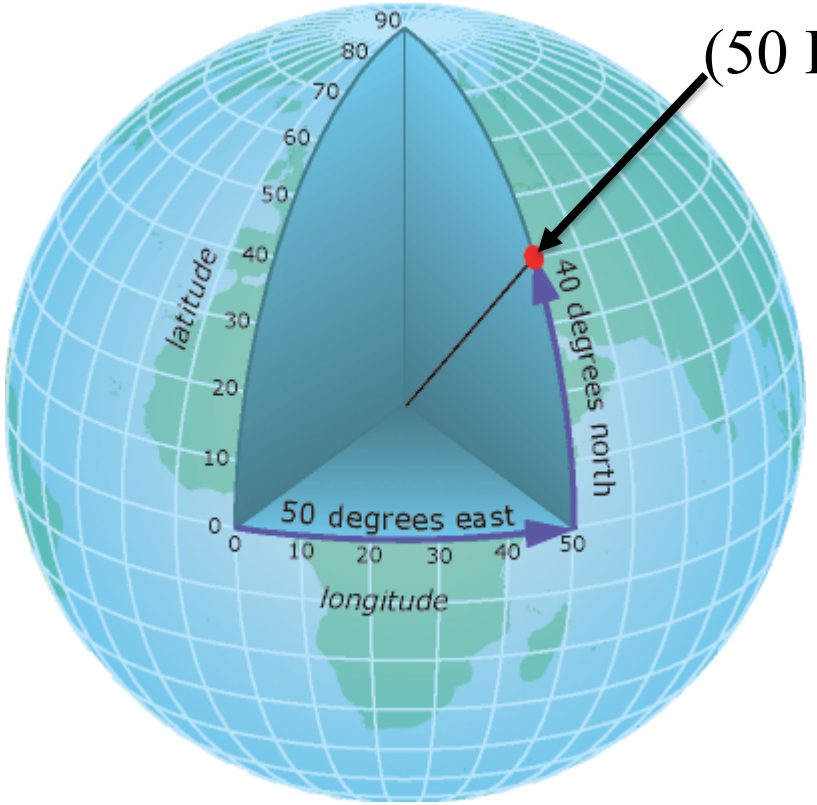
GCS

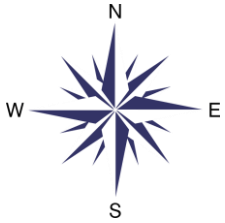




Source: http://desktop.arcgis.com/en/arcmap/10.3/guide-books/map-projections/about-geographic-coordinate-systems.htm

(50 E, 40 N)





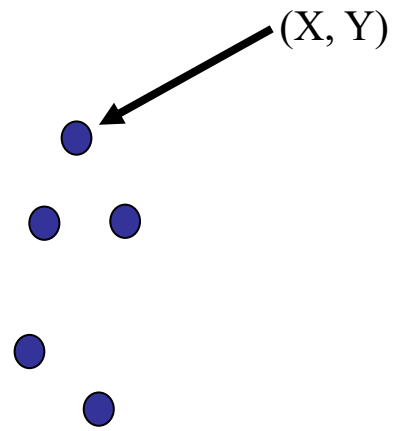
Source: http://desktop.arcgis.com/en/arcmap/10.3/guide-books/map-projections/geographic-coordinate-system.htm

Common Spatial Data Models

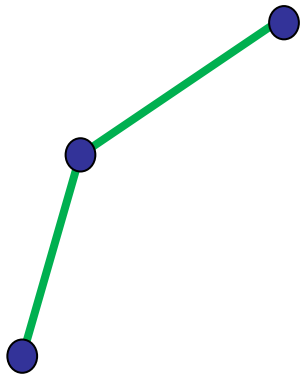
Vector

Raster

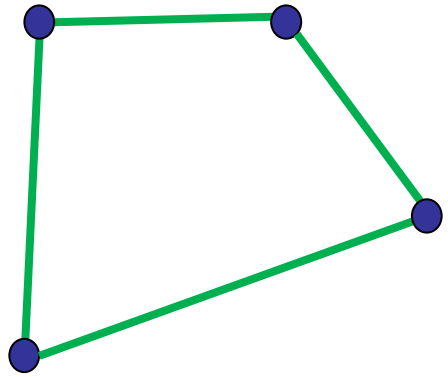
Common Spatial Data Models - Vector



Points



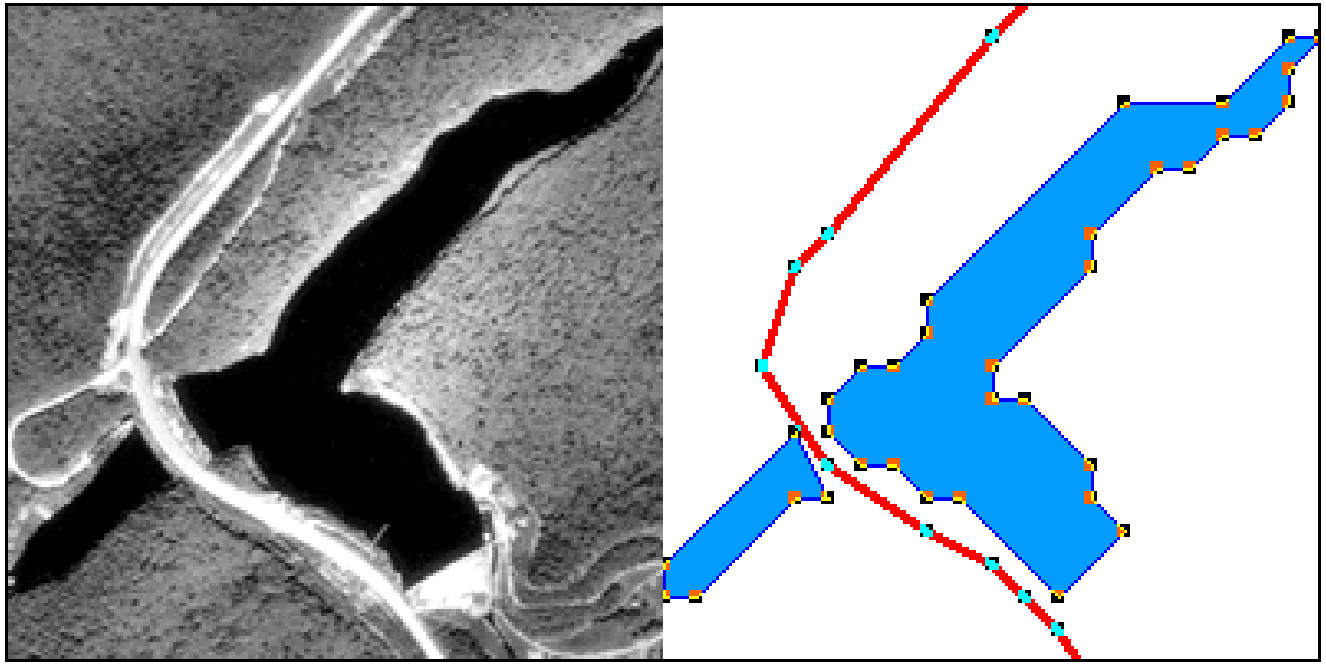
Polylines



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

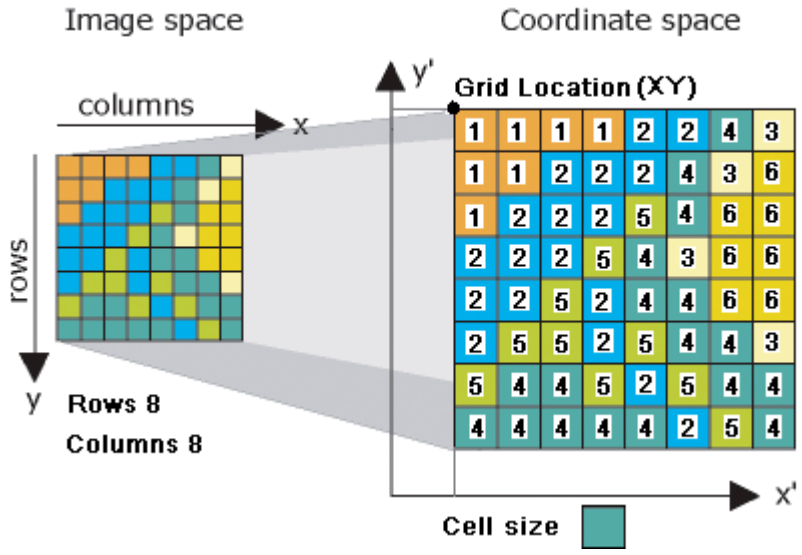
Vector

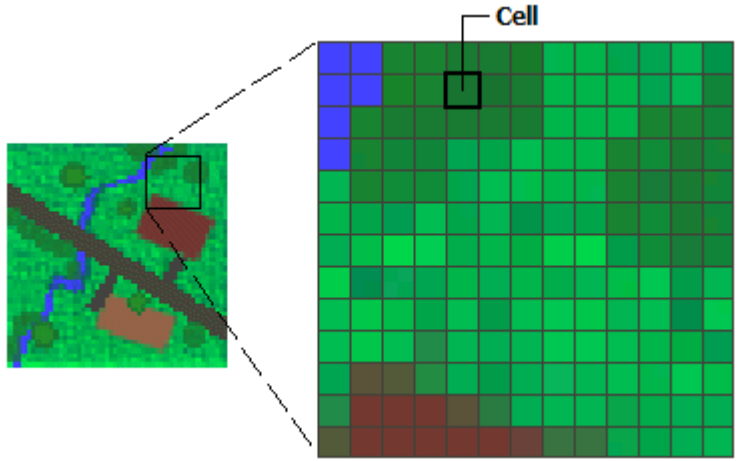
Raster

Common Spatial Data Models - Raster

Raster Data

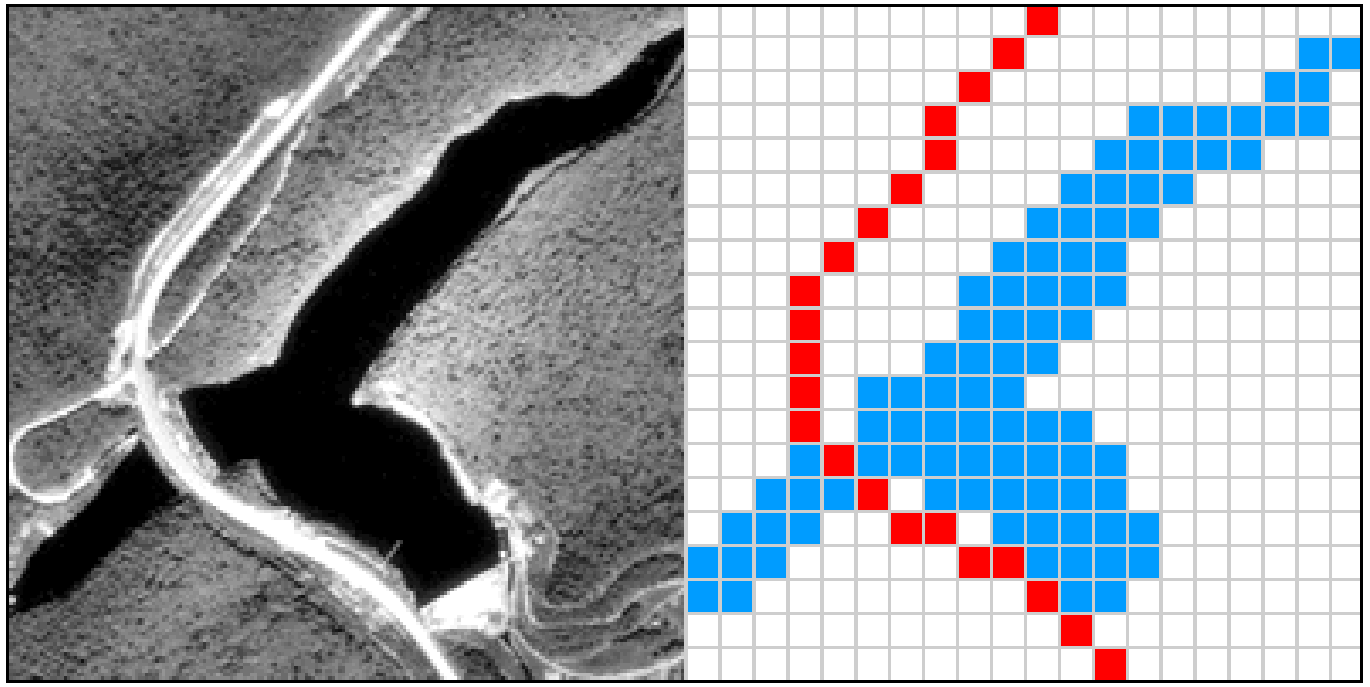
- continuous data
- uniform gridded data





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

Common Spatial Data Models - Raster



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

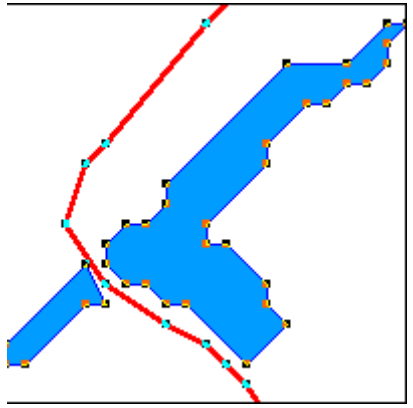
Common Spatial Data Models - Raster

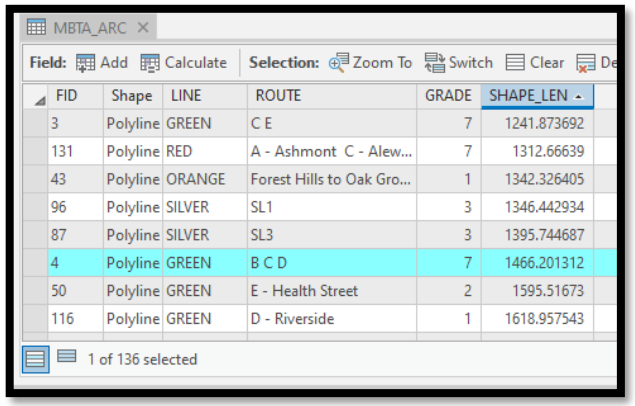
ArcGIS Pro Demo

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

Common Spatial Data Models - Review

Vector

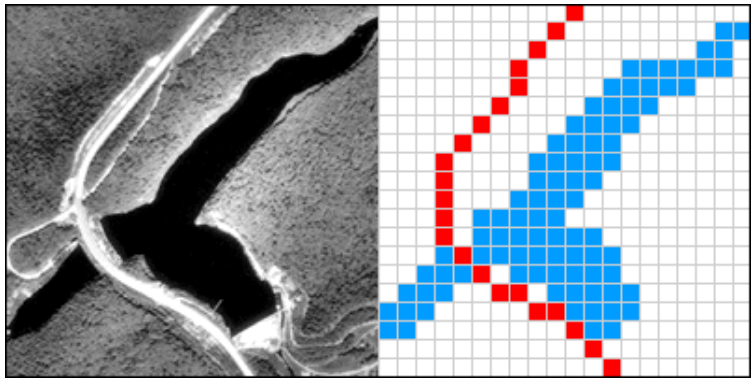




FID	Shape	LINE	ROUTE	GRADE	SHAPE_LEN
3	Polyline	GREEN	C E	7	1241.873692
131	Polyline	RED	A - Ashmont C - Alew...	7	1312.66639
43	Polyline	ORANGE	Forest Hills to Oak Gro...	1	1342.326405
96	Polyline	SILVER	SL1	3	1346.442934
87	Polyline	SILVER	SL3	3	1395.744687
4	Polyline	GREEN	B C D	7	1466.201312
50	Polyline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

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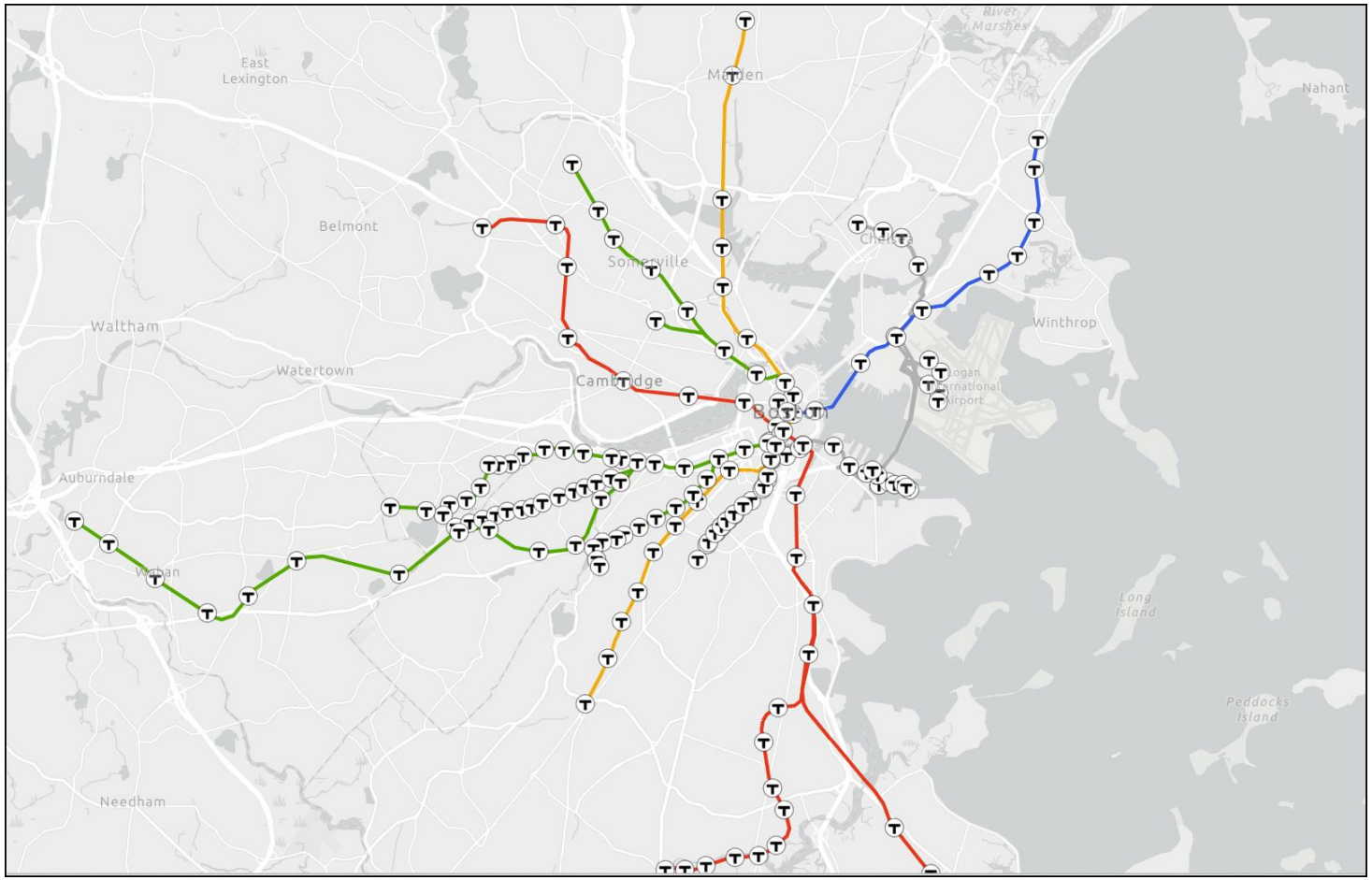
Vector or Raster?



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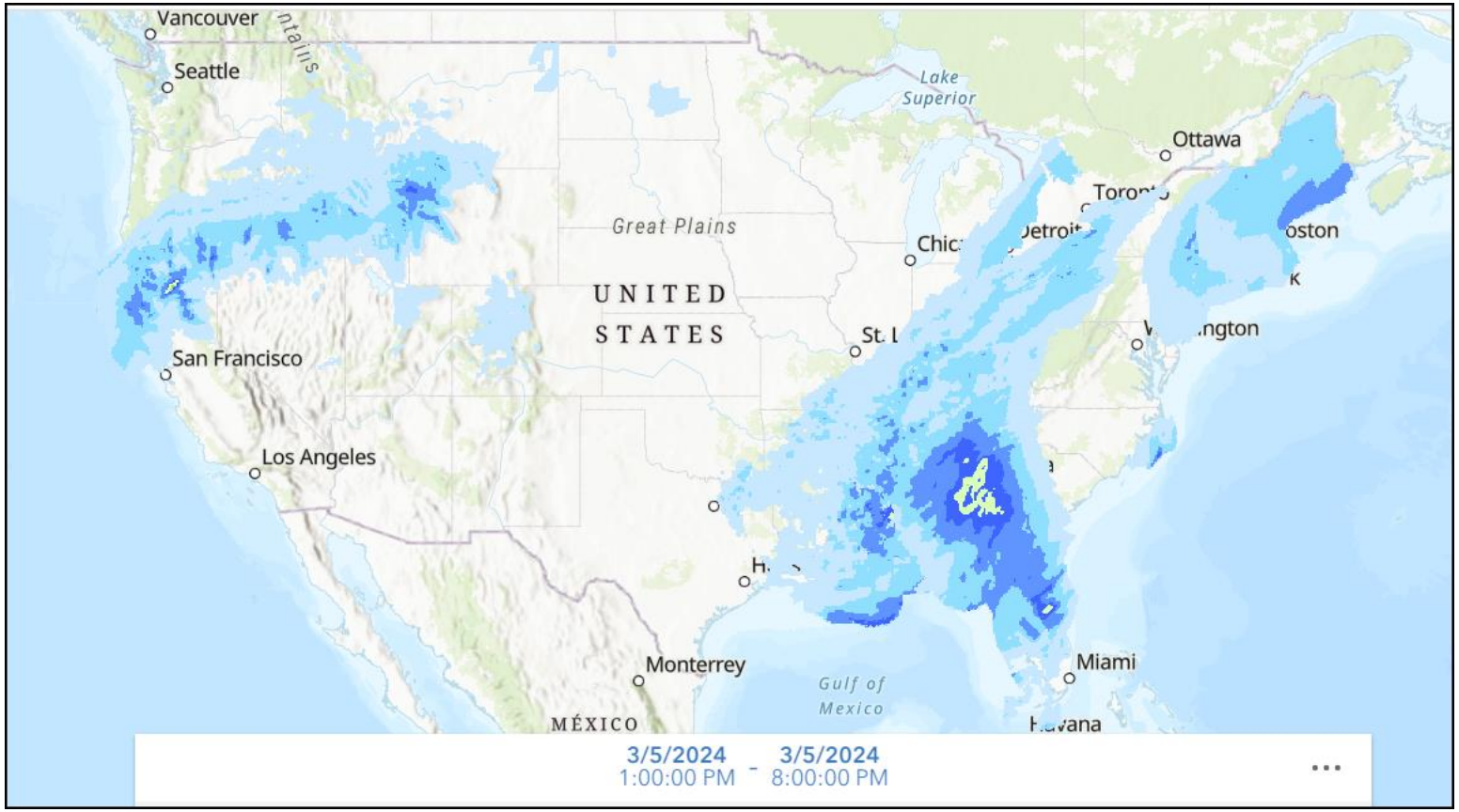
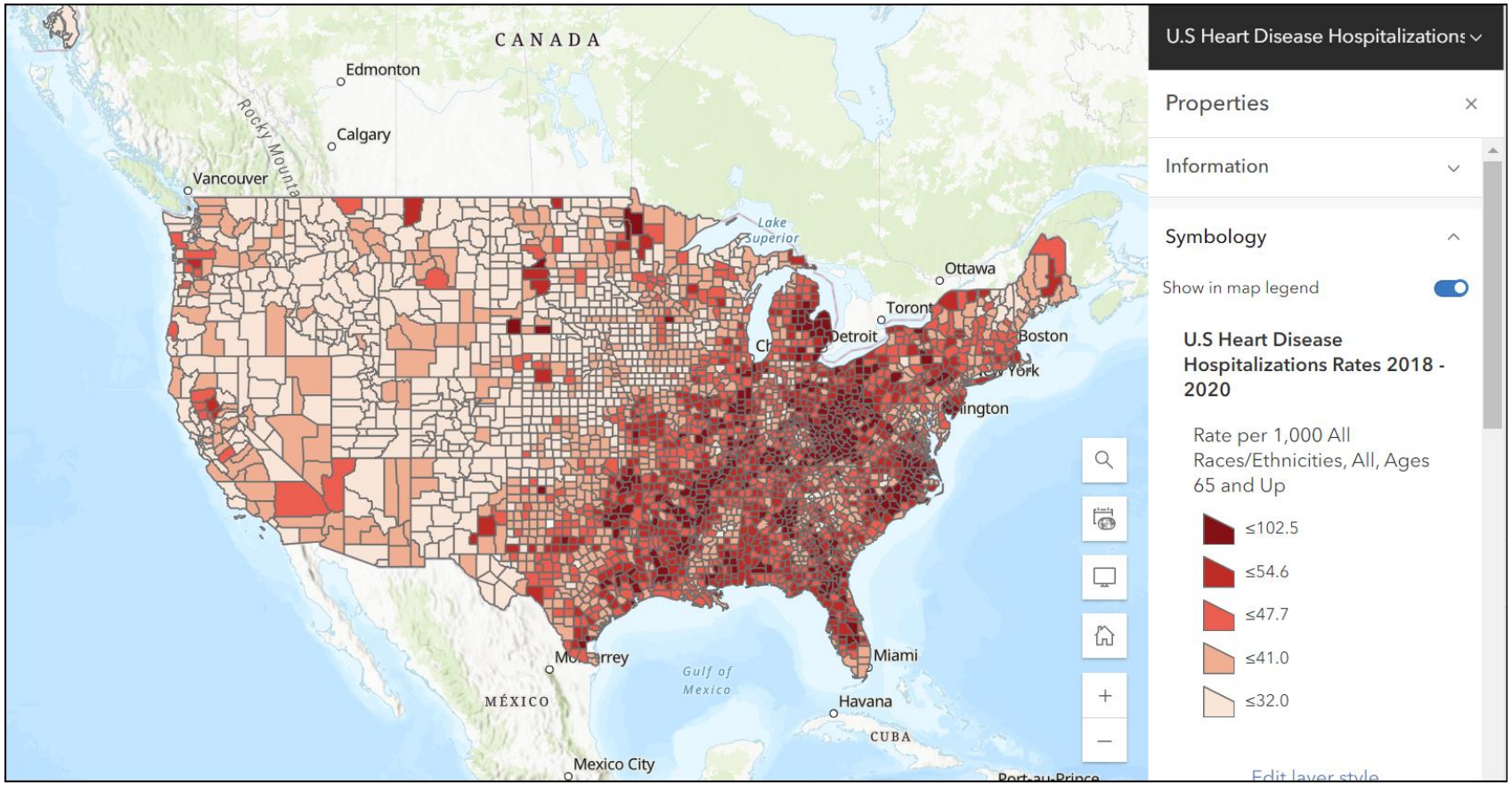


National Weather Service Precipitation Forecast

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

Vector or Raster?



U.S Heart Disease Hospitalizations Rates 2018 – 2020

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

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Could your data be presented in Vector or Raster format?

- Answer in Tutorial Google Doc
- https://github.com/milechin/buspark_gis

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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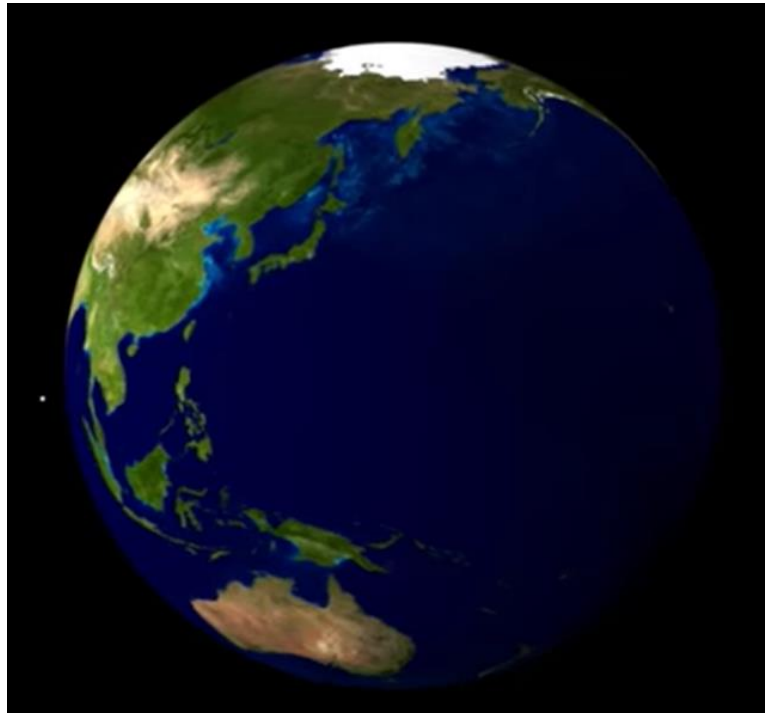
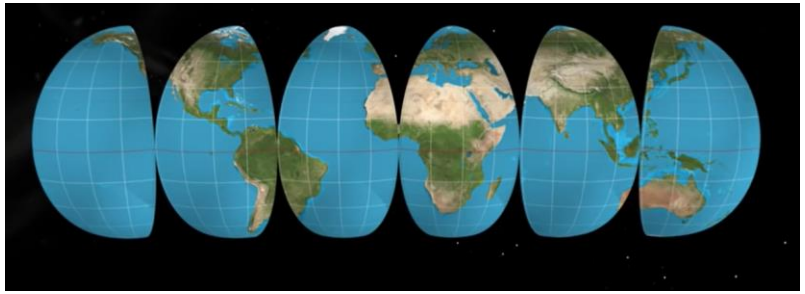
Projections

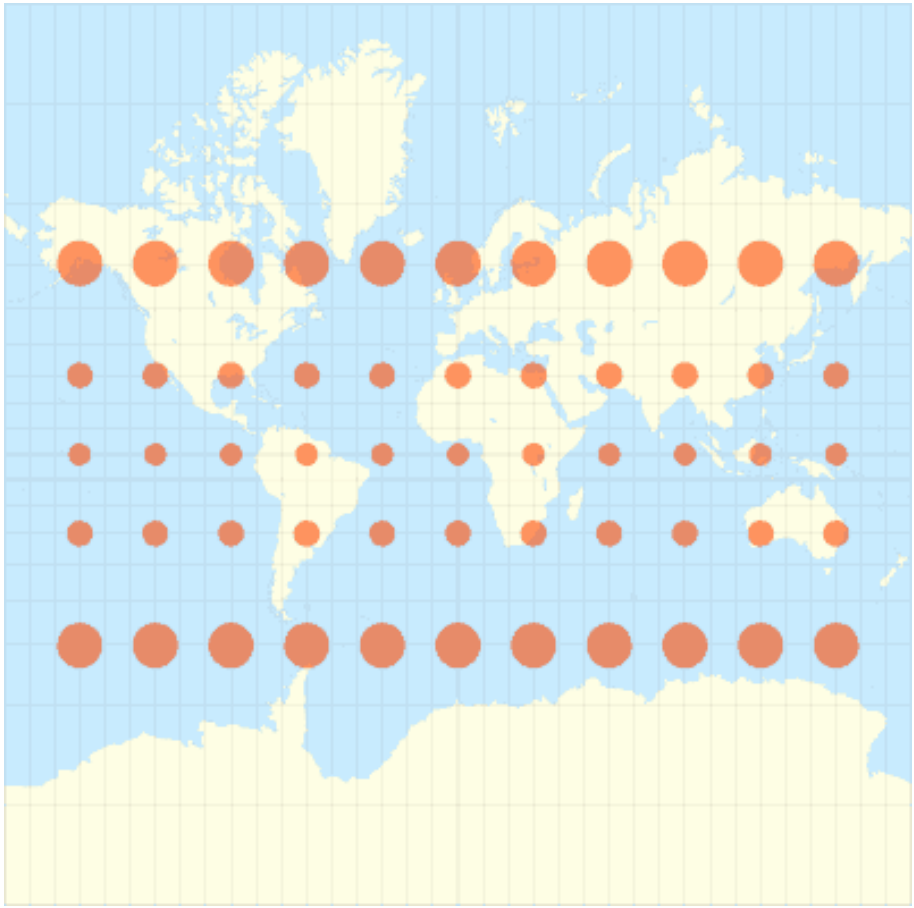




Source: https://www.youtube.com/watch?v=CPQZ7NcQ6YQ
Additional Reading:
https://laughingsquid.com/world-mercator-projection-map-country-size/

Projections

Visualizing Distortions



Source and Additional Reading:
http://geokov.com/education/map-projection.aspx

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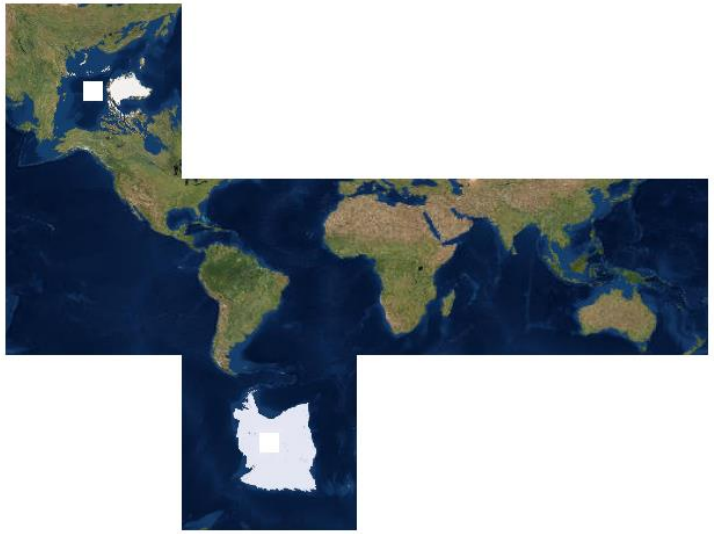
Projections

- 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 5N

Is your area of interest impacted by distortion?

- Answer in Tutorial Google Doc
- https://github.com/milechin/buspark_gis

Break 1

Exploring ArcGIS Online Apps

- Instant App – Simple Web Maps
- Dashboards – Web maps with interactive widgets
- StoryMaps – An application for story telling with maps.

Explore ArcGIS Instant App

- Instant App Gallery
  - https://doc.arcgis.com/en/instant-apps/gallery/

- Link available at:
- https://github.com/milechin/buspark_gis

- **Activity:** Find 1 or 2 examples of Instant App that you really like or might be a good template for your project. Record this in the Tutorial Google Doc.

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Explore ArcGIS Dashboards

- Instant App Gallery
  - https://doc.arcgis.com/en/dashboards/gallery/

- Link available at:
- https://github.com/milechin/buspark_gis

- **Activity:** Find 1 or 2 examples of Dashboards that you really like or might be a good template for your project. Record this in the Tutorial Google Doc.

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Explore ArcGIS StoryMaps

- Instant App Gallery
  - https://doc.arcgis.com/en/arcgis-storymaps/gallery/

- Link available at:
- https://github.com/milechin/buspark_gis

- **Activity:** Find 1 or 2 examples of Dashboards that you really like or might be a good template for your project. Record this in the Tutorial Google Doc.

Let’s Explore ArcGIS Online

BU ArcGIS Online Portal Link:

https://bucas.maps.arcgis.com/

Explore ArcGIS Online Atlas

BU ArcGIS Online Portal Link:

https://bucas.maps.arcgis.com/

- **Activity:** Search for data that might be relevant to your project and save it to favorites.

Break 2