Visualizing Geospatial Data

ARCGIS ONLINE

Data Types

Qualitative (characteristic)

Categorical data is described by categories.

Categorical data is typically **nominal**, meaning the data is unordered.

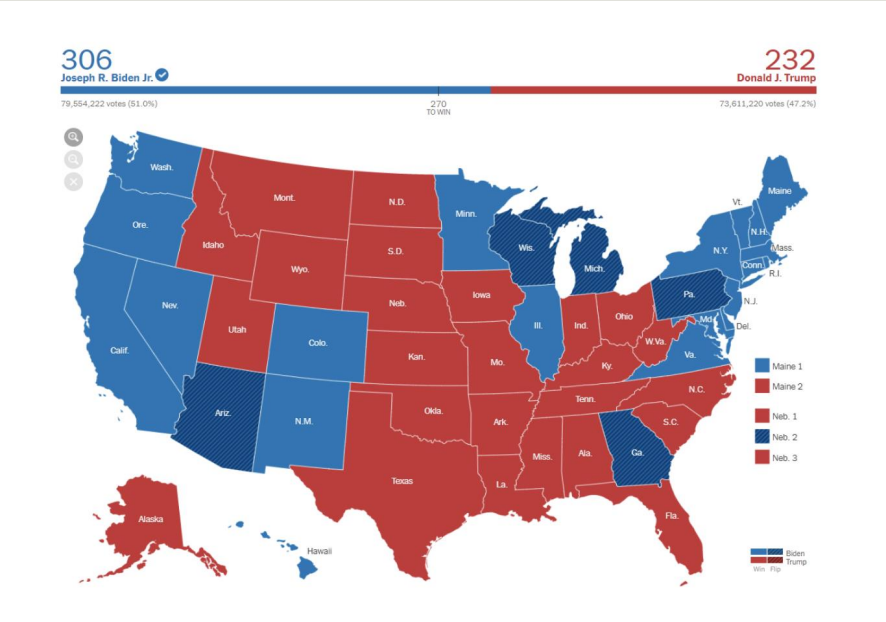
Quantitative (numerical scale)

Numerical data is described as a number.

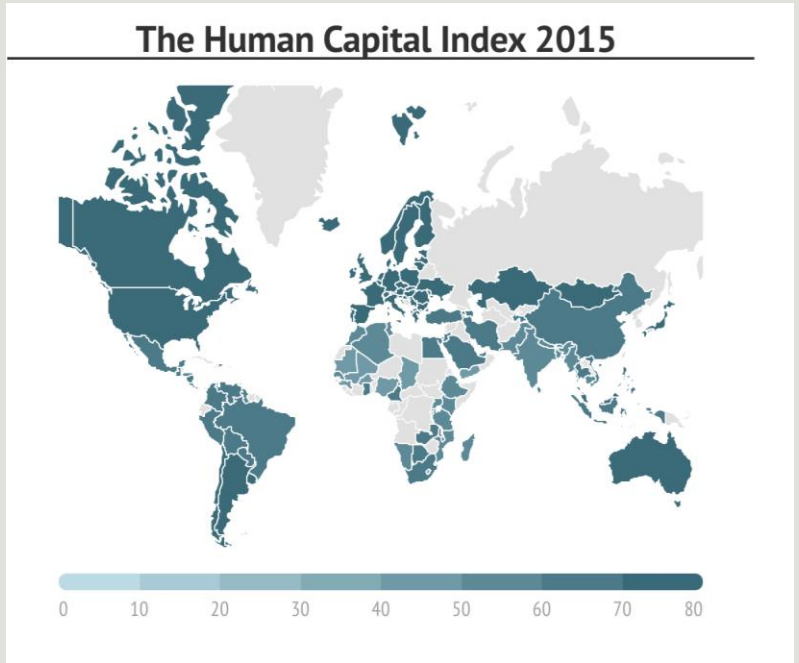
Numerical data can be:

- **ordinal** – in a scale, or ordered by numeric value
- **discrete** – where the data plugs into a limited range of values
- **continuous** – where there is an infinite range of possible values

Color



Use contrasting colors for comparisons to help the viewer differentiate the data quickly.



Use one color to represent continuous data – Representing continuous data and ranges by varying the saturation or value of a color makes you chart straightforward and easy to read.

https://infogram.com/blog/color-theory-dos-and-donts-for-data-visualizatin/

Visualizing Uncertain Information,

Cartographic Perspective

Conceptual model for selecting cartographic symbolization based on data analysis.

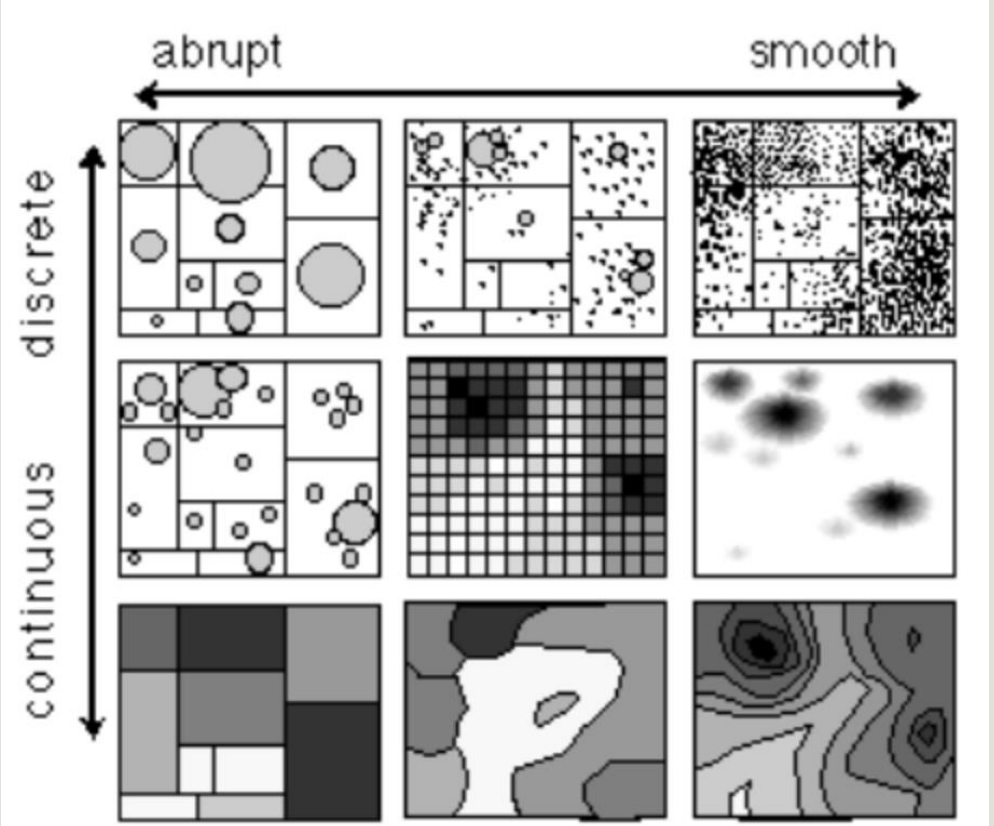
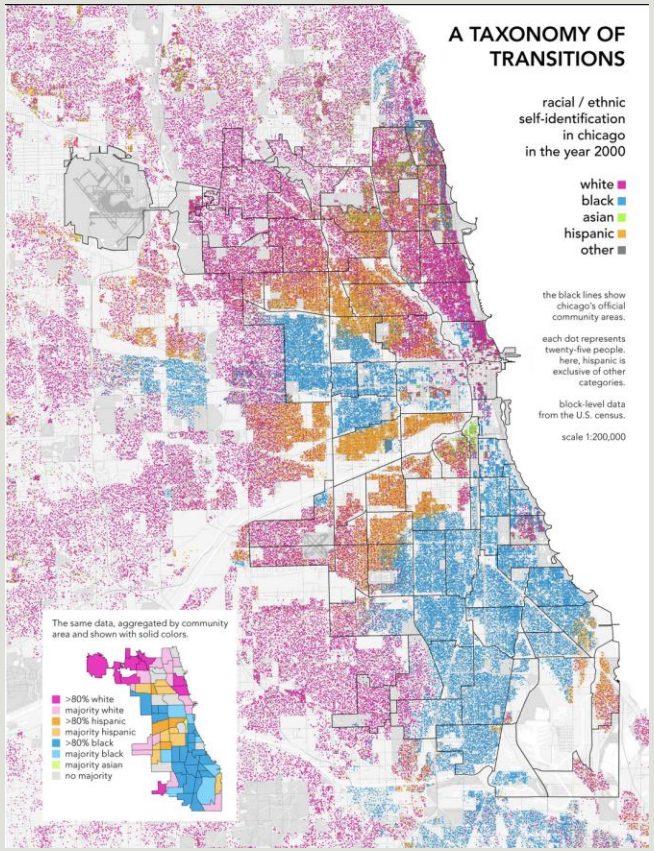


Fig. 9. Possible 2D translations of the 3D data models shown in figure 8.

https://cartographicperspectives.org/index.php/journal/article/view/cp13-maceachren

Dot Distribution (Dot Density)



Each color represents people of a certain race or income level

Each dot represents every 25 people in the datum

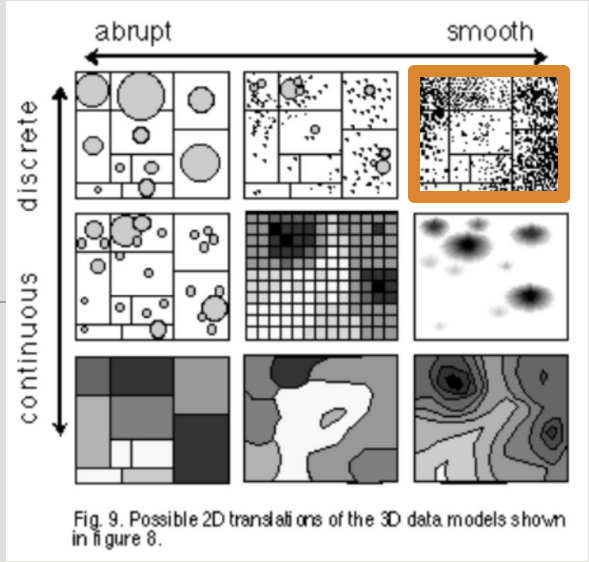
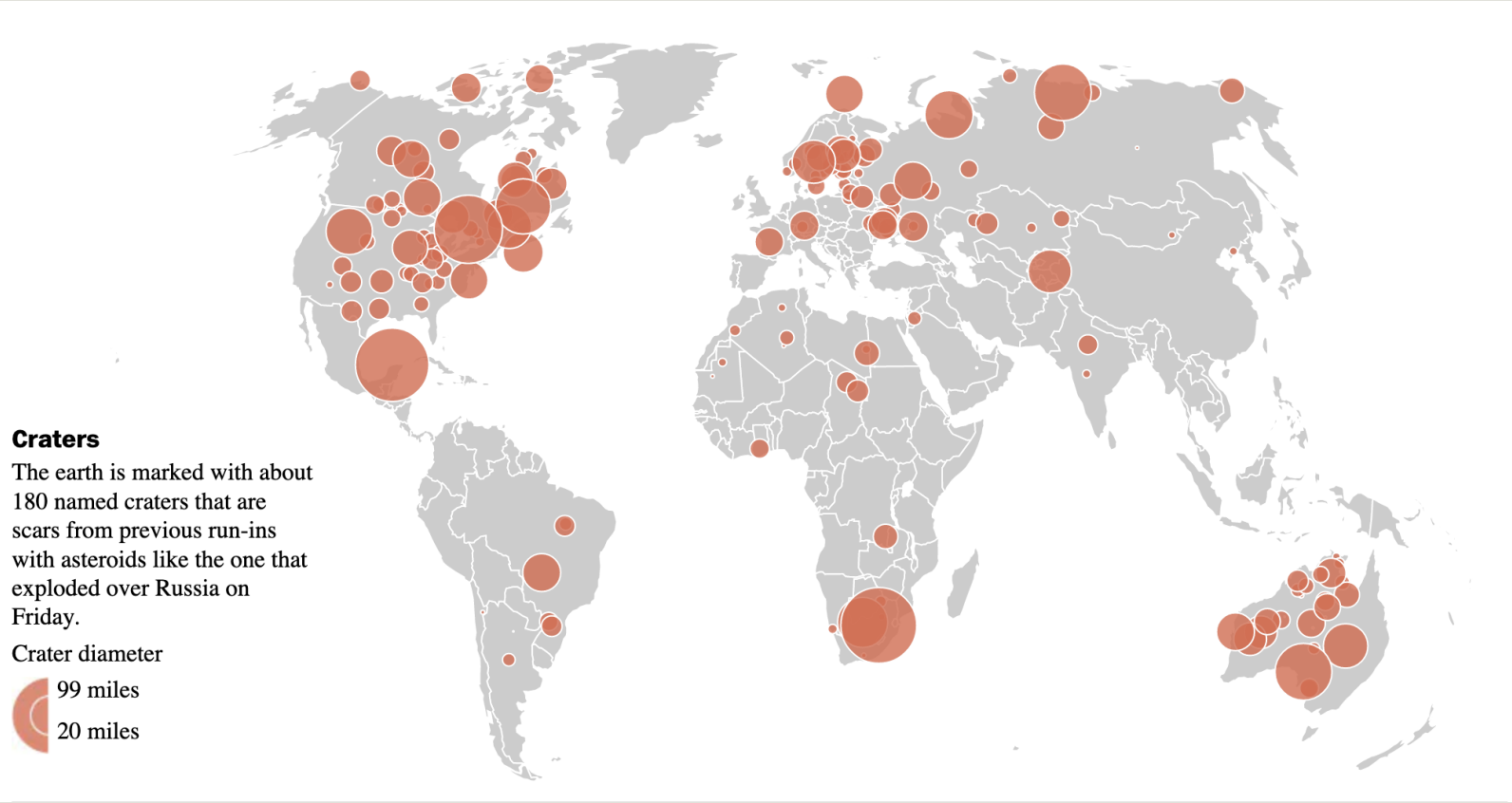


Fig. 9. Possible 2D translations of the 3D data models shown in figure 8.

http://www.radicalcartography.net/index.html?chicagodots

Proportional Symbol



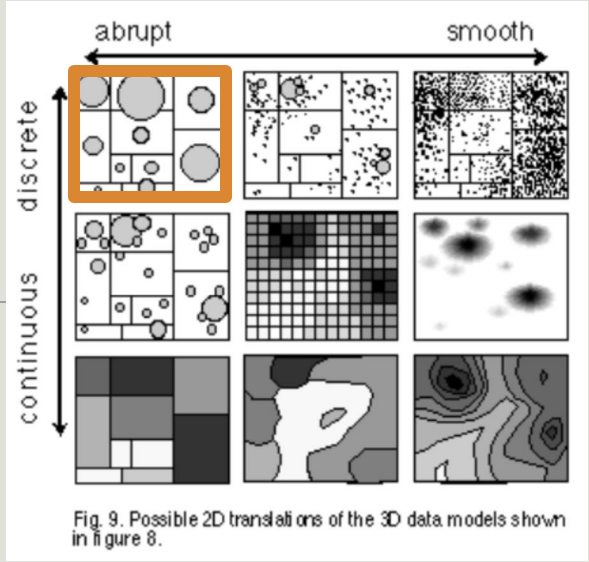
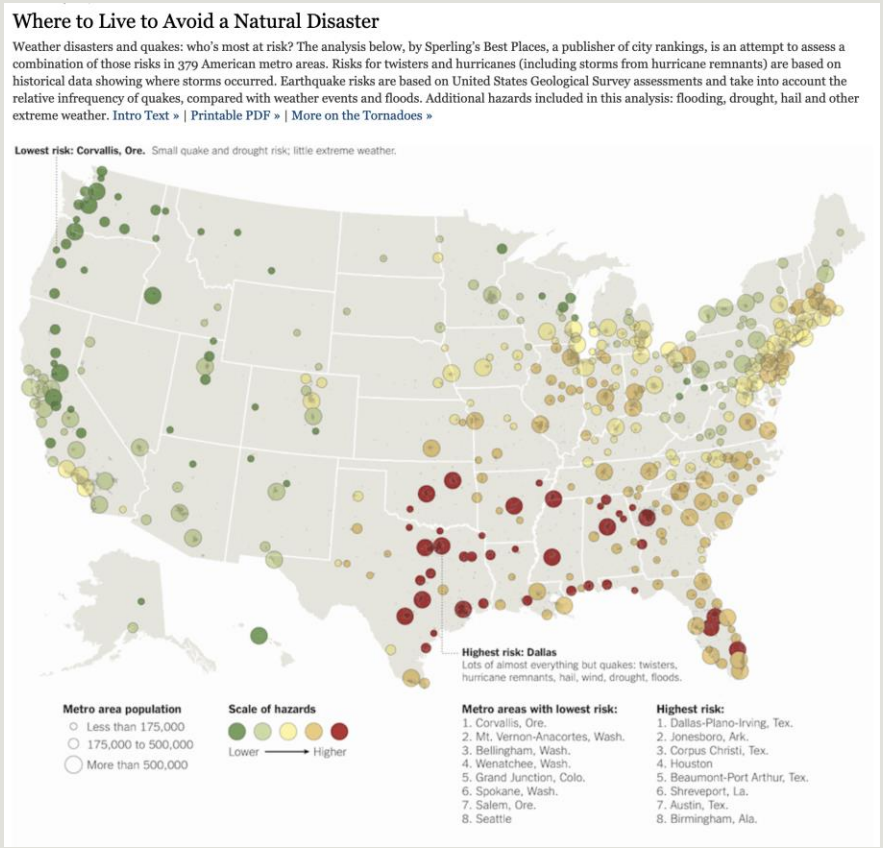


Fig. 9. Possible 2D translations of the 3D data models shown in figure 8.

Size of the dot is proportional to the size of the meteor crater in the datum

https://www.washingtonpost.com/wp-srv/special/world/russia-meteor/index.html

Graduated Symbol



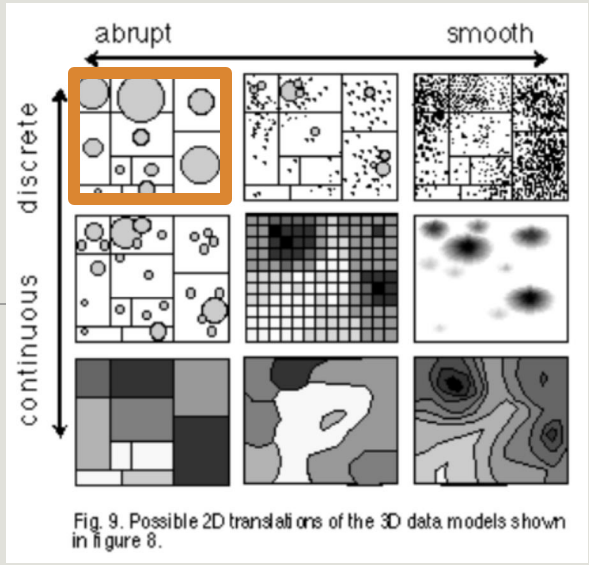


Fig. 9. Possible 2D translations of the 3D data models shown in figure 8.

Color of the dot shifts from green to red to indicate a low to high risk level in the datum.

https://archive.nytimes.com/www.nytimes.com/interactive/2011/05/01/weekinreview/01safe.html?_r=0

Isopleth (heat map)

Uses graduated color (continuous color scheme) to risk levels from specific natural disaster in the datum. The lighter the color is tied to lower value and darkest color is tied to higher value.

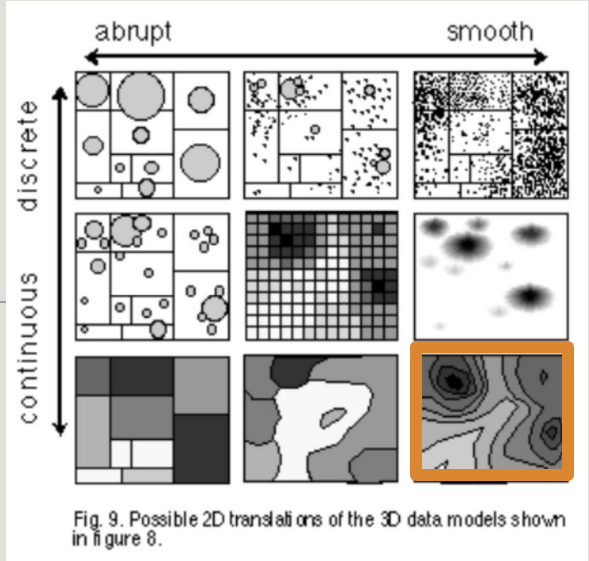
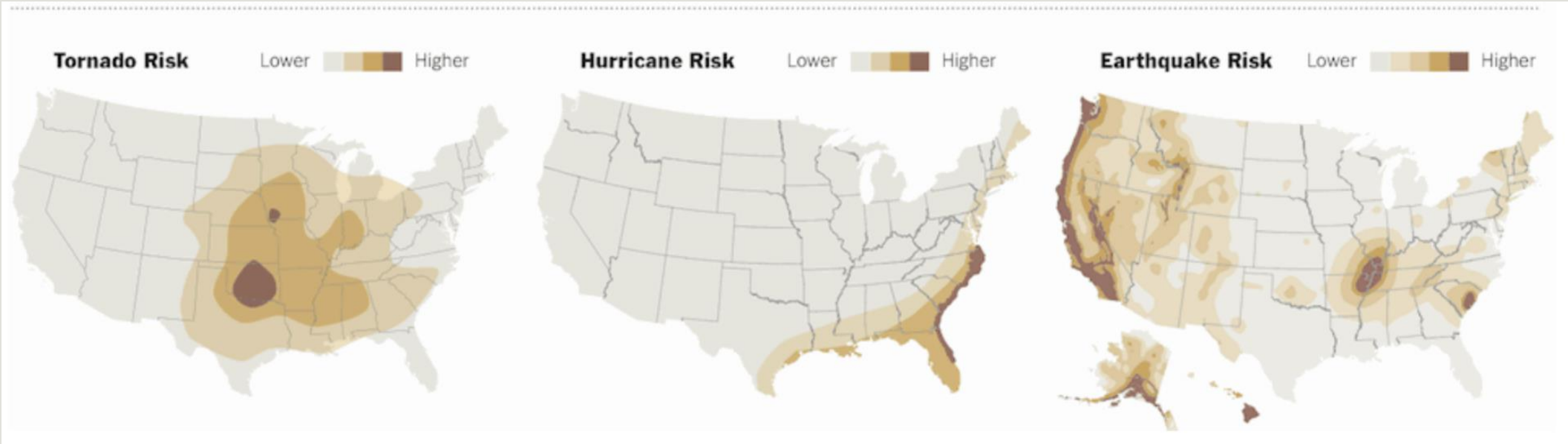
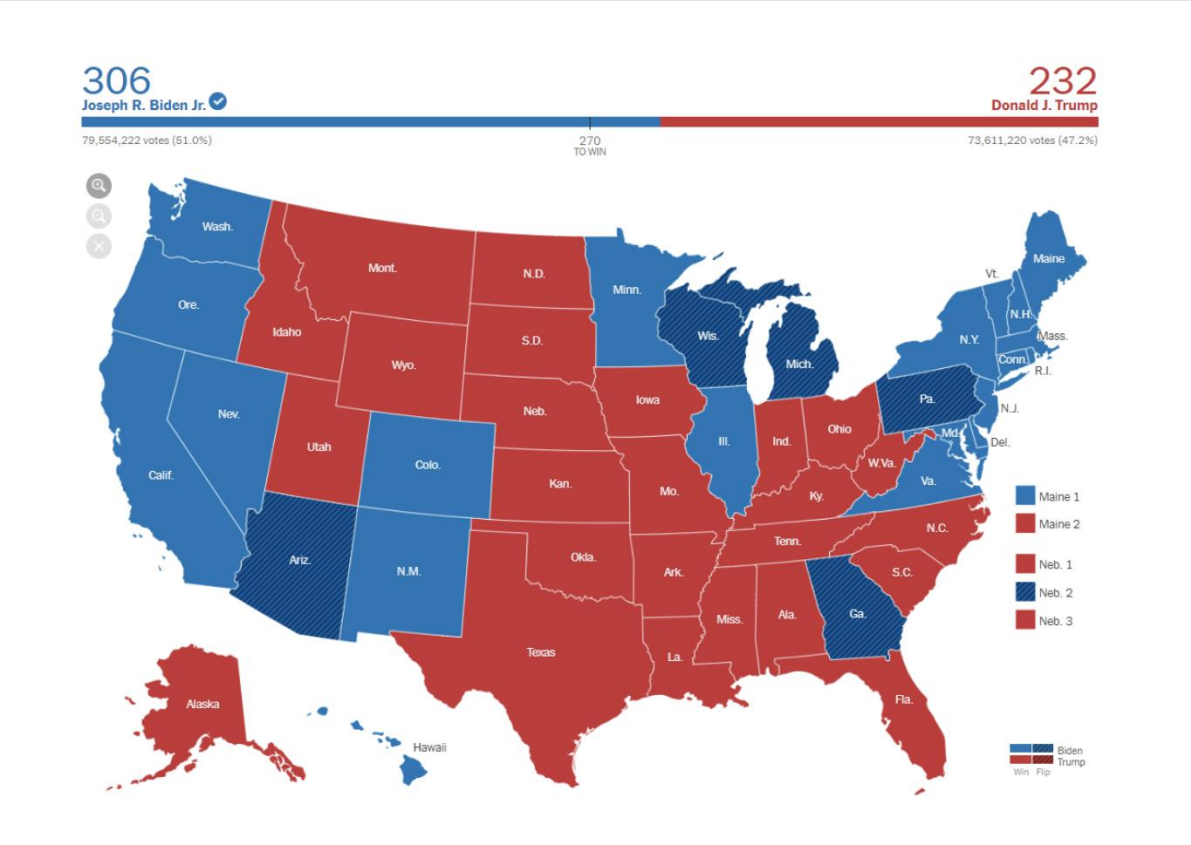


Fig. 9. Possible 2D translations of the 3D data models shown in figure 8.



https://archive.nytimes.com/www.nytimes.com/interactive/2011/05/01/weekinreview/01safe.html?_r=0

Choropleth



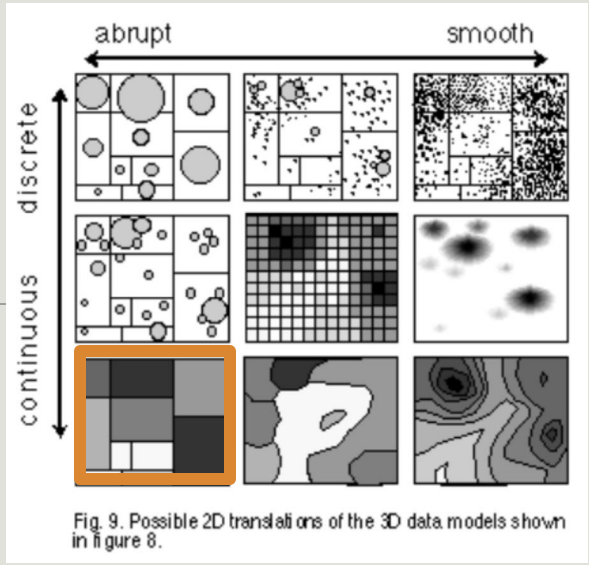


Fig. 9. Possible 2D translations of the 3D data models shown in figure 8.

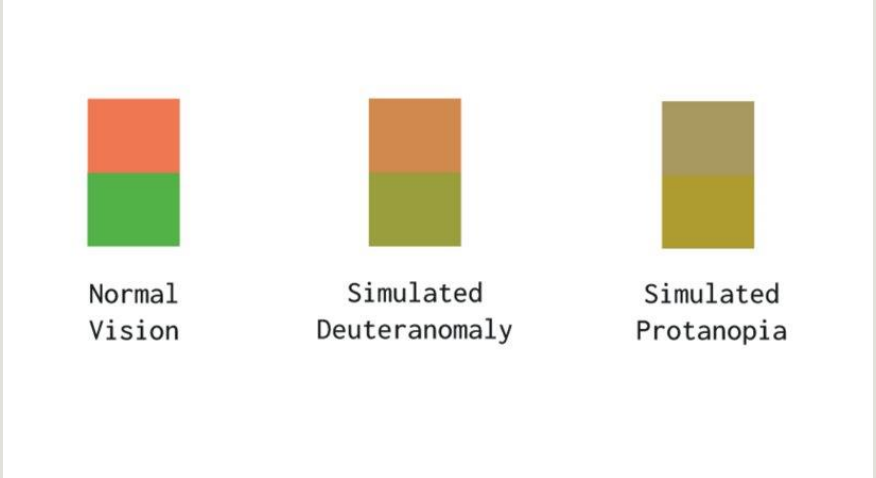
Choropleth is a set of pre-defined geographic areas colored or patterned in proportion to a statistical variable.

https://www.nytimes.com/2020/11/19/learning/whats-going-on-in-this-graph-2020-presidential-election-maps.html

Color Accessibility

Roughly 4 percent of the population has some sort of color blindness. Red-green color blindness (deuteranopia) is the most common type of color deficiency that causes difficulty seeing different shades of red, green, and yellow.

Test your color palette for color deficiencies:
https://projects.susielu.com/viz-palette



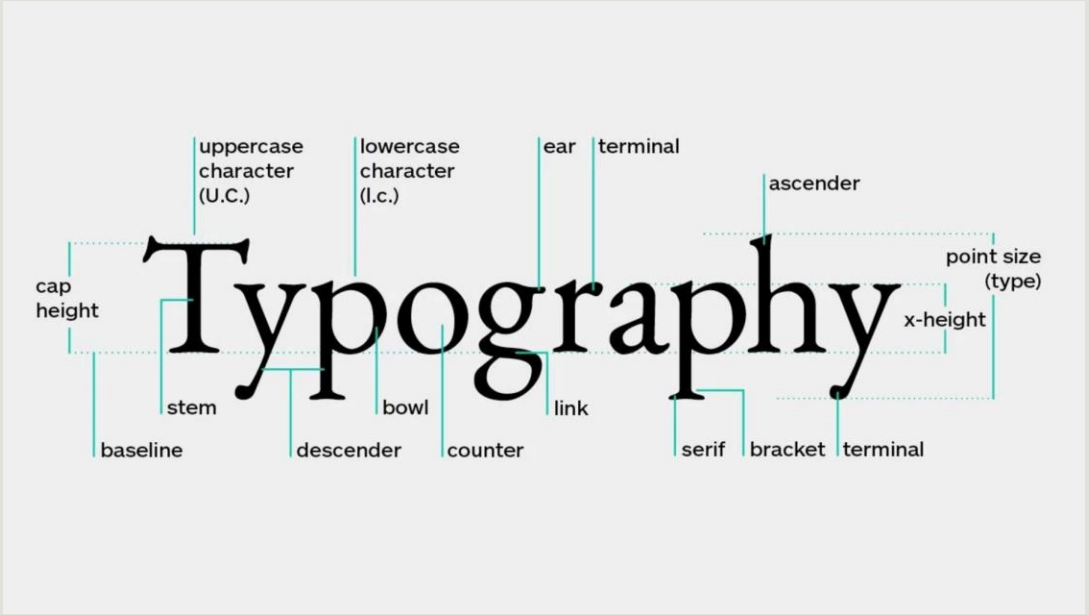
https://www.revunit.com/post/the-role-of-color-theory-in-data-visualization

Typography

Establish a clear hierarchy of typographic elements and using easy-to-read font families will help users better understand and interact with your data.

Opt for a typeface with:

- large x-height
- consistent, open counter.
- sans-serif typeface for small labels.
- uses lining and tabular figures when displaying numbers



Interaction

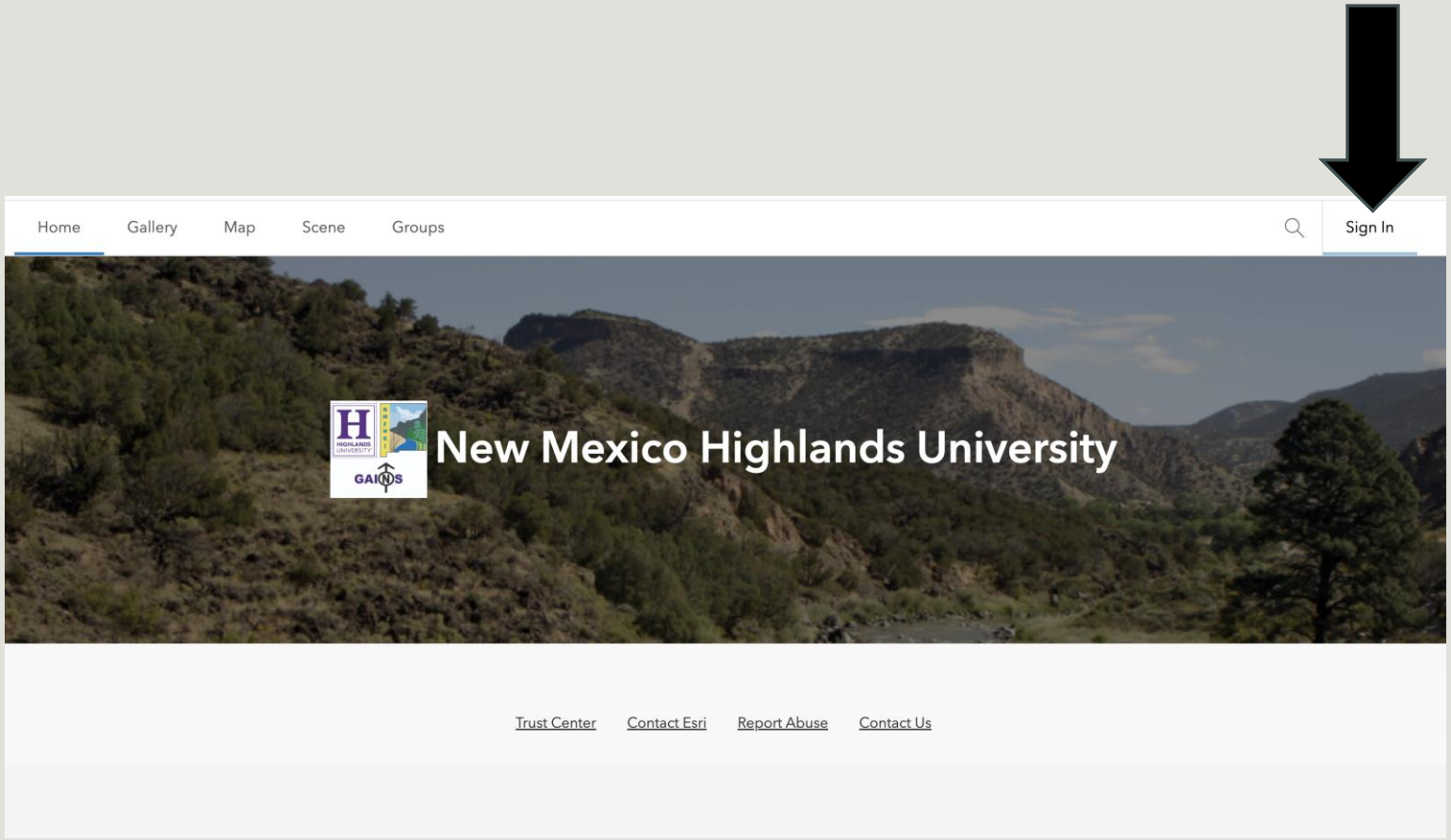
– Use tooltips/pop-up/popover to highlight key details

– Use sliders for time series data

Login

Use your NMHU credentials to login

Login here: https://nmhu.maps.arcgis.com

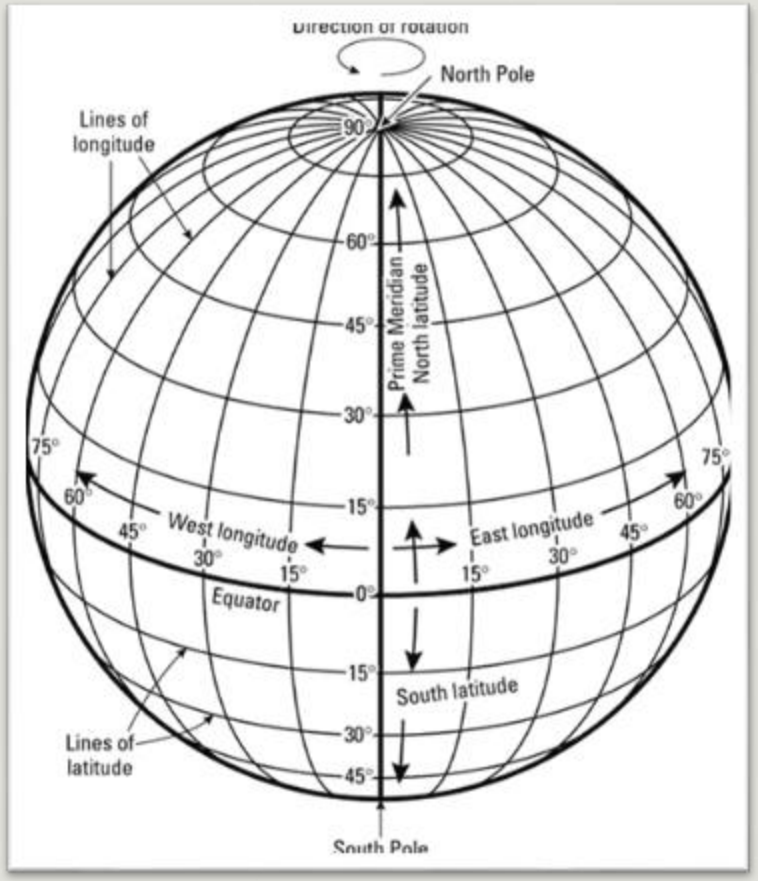


Geographic Coordinate System

Latitude – angles that run north and south of the equator

Longitude – angles that run east and west of the prime meridian

Graticule – grid lines formed by latitude and longitude



https://pro.arcgis.com/en/pro-app/latest/help/mapping/properties/coordinate-systems-and-projections.htm

Map Projections

A map projection is a way to use mathematical calculations to convert the coordinate system used to flatten the globe's surface into a plane to create a map.

Map projections are classified based on the projection surface as well as properties of the model they preserve.

Surface

- Planar/Azimuthal
- Cylindrical
- Conic
- Etc...

Model (metric) Preservation

- Conformal (shape/angle)
- Equidistant (distance)
- Equal-Area (area)

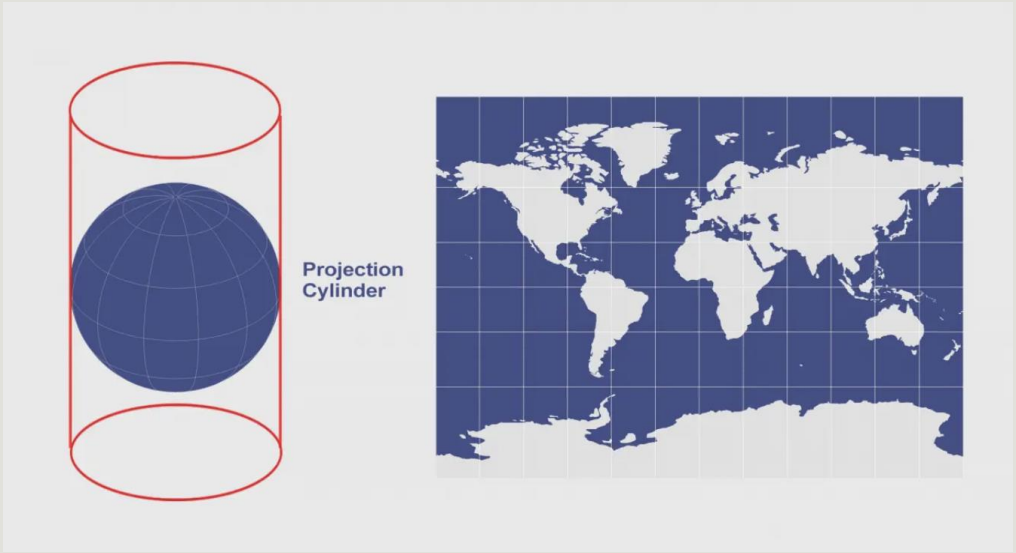
https://pro.arcgis.com/en/pro-app/latest/help/mapping/properties/list-of-supported-map-projections.htm

Mercator Projection

Flemish cartographer Gerardus Mercator created the Mercator projection by mathematically projecting a vertically oriented cylinder tangent to the Equator.

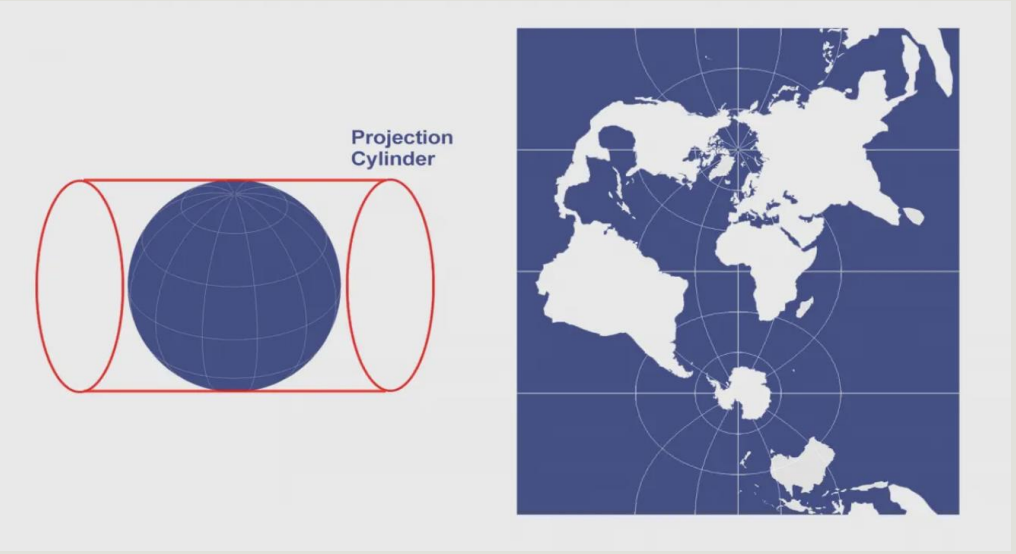
The cylinder can be placed in a vertical, horizontal, or oblique position.

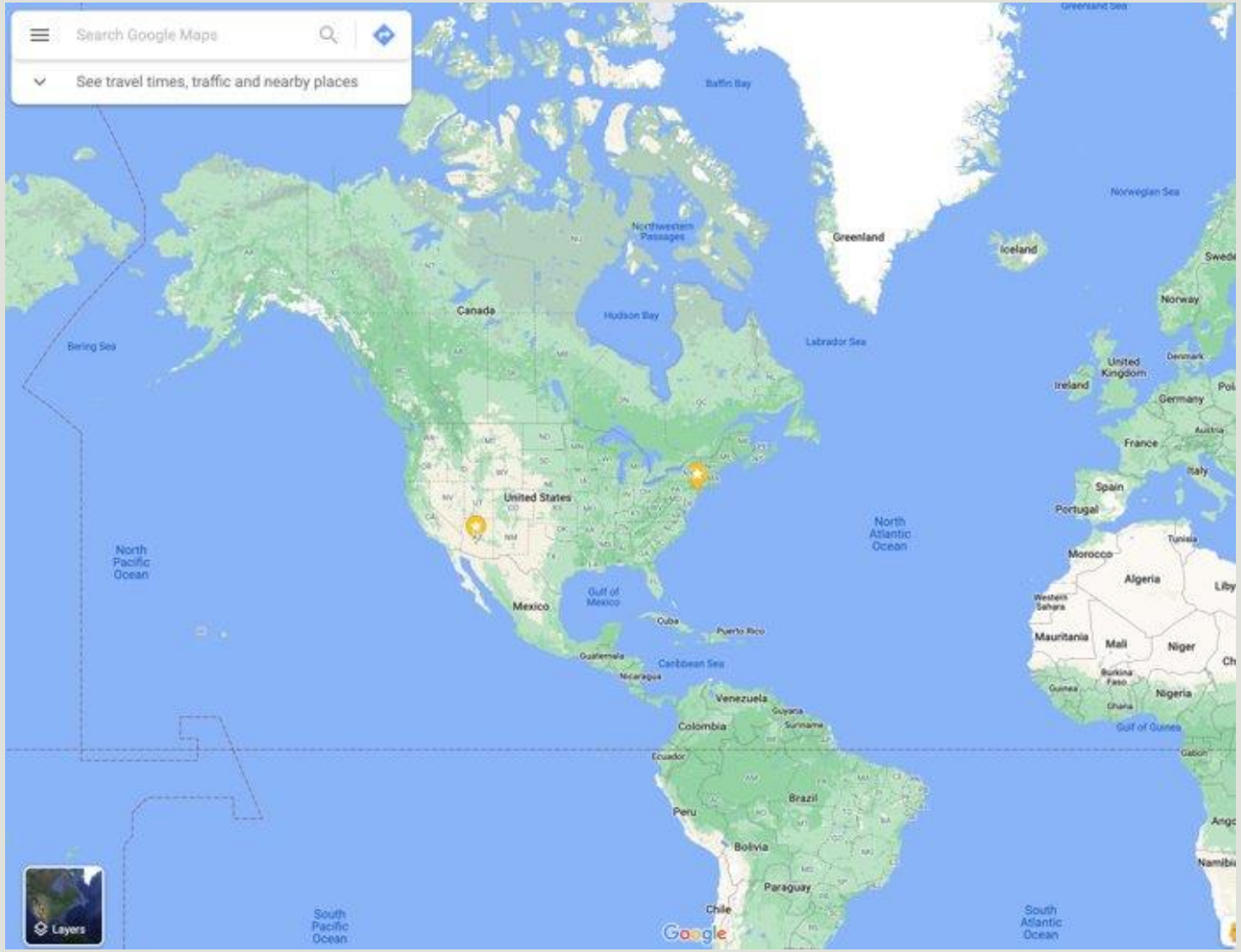
Vertical



Horizontal

Land size near south and north poles are distorted.





Web Mercator

Web Mercator aka Google Web Mercator, Spherical Mercator, WGS 84 Web Mercator or WGS 84 or Pseudo-Mercator is a variant of the Mercator map projection and is the de facto standard for Web mapping applications.

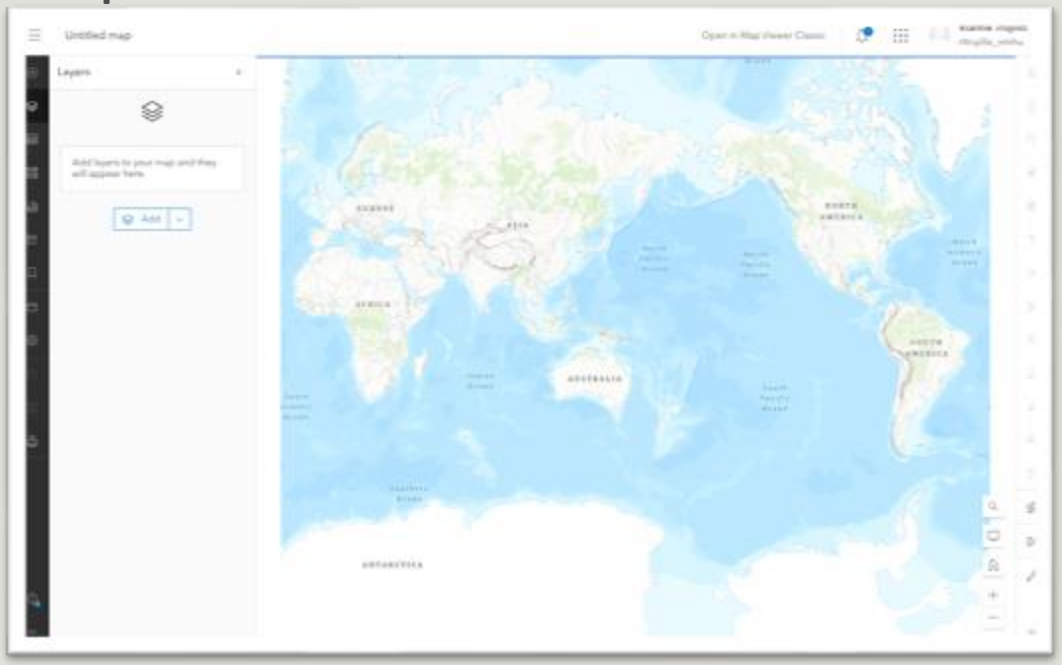
It rose to prominence when Google Maps adopted it in 2005. Web Mercator it shows true direction between places, but land mass is not equal-area or equidistant.

ArcGIS Pro will auto set the map projection based om the data placed in the first layer

ArcGIS Projection

The default horizontal coordinate system is WGS84 Web Mercator for maps and scenes. For global scenes, the default horizontal coordinate system is WGS84.

map



scene

Map Tiles/Style (base map)

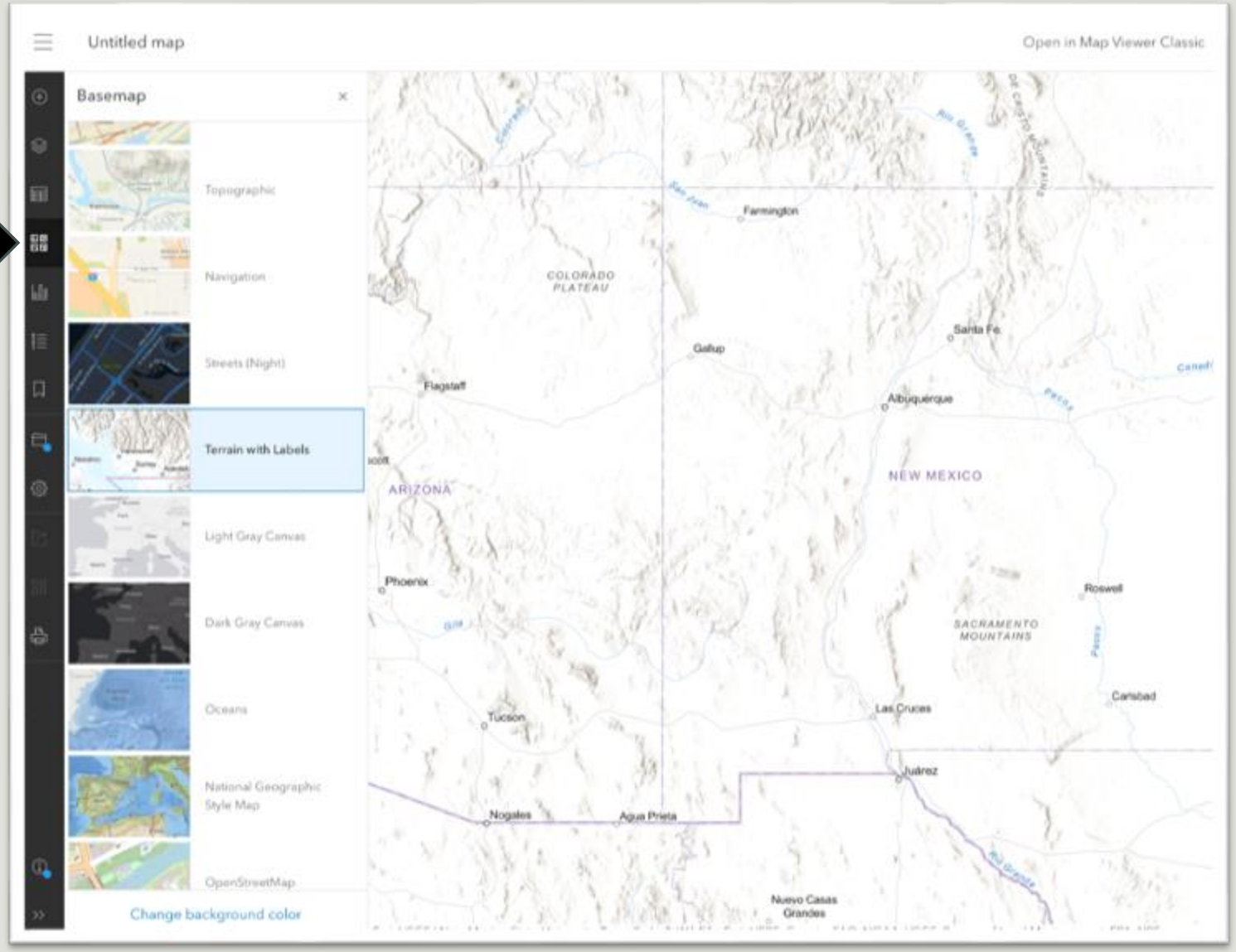
Map Tiles represent the visual base style of a map.

Tile Services like OpenStreetMap, Mapbox, Bing or other services provide a url that returns image tiles (rasterized/vector) at different coordinates and zoom levels.

http://tile.example.com/{z}/{x}/{y}.json

See Examples:

https://medium.com/@daniel_819/the-10-best-free-to-use-map-layers-8c8e1b4ad0a



ArcGIS basemap

You can swap the basemap. Basemap styles are styled with different color or label fonts. Features such as state boundaries, city names, rivers, roads, etc can be shown or hidden at different zoom levels.

ArcGIS Living Atlas

ArcGIS Living Atlas is a collection of geographic information from around the globe. Choose from basemaps, imagery, and various data layers and add to your map

Get Layers here: **https://livingatlas.arcgis.com/en/browse**

Working with your own geospatial data?

Map Features

Map layers with data typically consist of coordinates and various features such as the geometry and properties that make up a visual representation on the map – such as line, point, marker, etc

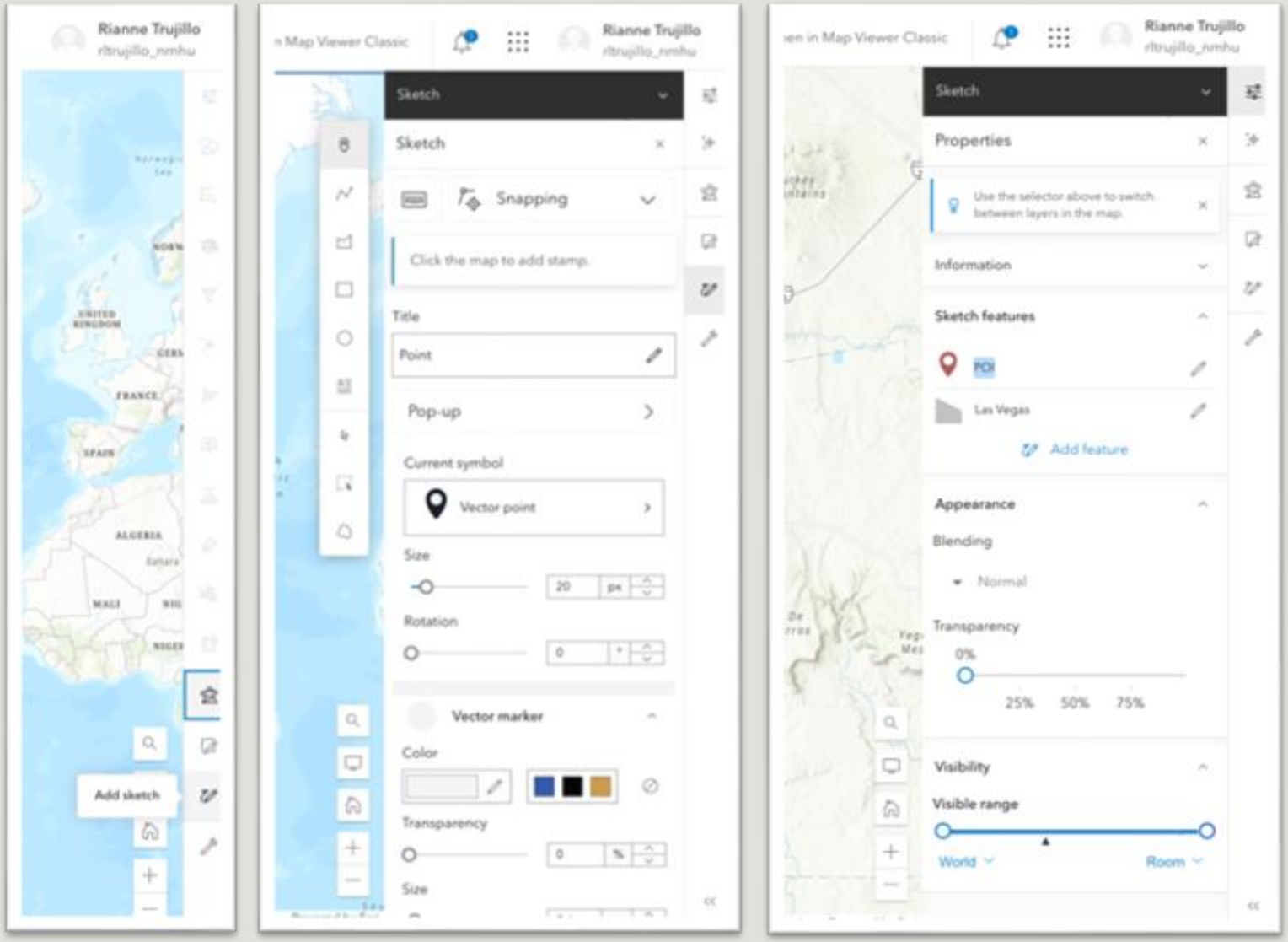
Common Data Formats

– CSV: provides a table of columns and rows that make up geographic features

– GEOJSON: data structure with properties and values containing geographic features (similar to JSON)

– KML/KMZ: set of xml tags with attributes and content containing geographic features (similar to html)

– Shapefile: image assets and other files that define the bounds of the shape/image in coordinates



ArcGIS map sketch tool

Create your own point, line, polygon or text feature using the map sketch tool

Tips for creating CSV dataset

- Use Microsoft Excel, Apple Numbers, Google Docs, or other spreadsheet software that supports csv format
- Create a table with defined headers
- Use latitude and longitude columns for geospatial data
- Export as comma delimited CSV file

Make your own GEOJSON

One of the most common formats for maps on the web is GeoJSON. This format is used to encode a variety of geographic data structures.

GeoJSON markup consists of JSON objects that define geometry (linestring, point, polygon, etc), coordinates and other data properties.

```
{
  "type": "FeatureCollection",
  "features": [
    {
      "type": "Feature",
      "properties": {},
      "geometry": {
        "coordinates": [
          24.050448405388636,
          2.05378901533102
        ],
        "type": "Point"
      }
    }
  ]
}
```

Create a GeoJSON dataset:
https://geojson.io

Find Datasets

- City of Albuquerque Open Data: https://www.cabq.gov/abq-data
- US Gov (filter by file type and data): https://catalog.data.gov/dataset?res_format=CSV&tags=gis
- US Census: https://data.census.gov/cedsci/
- USGS: https://www.usgs.gov/products/data-and-tools/gis-data
- Free GIS data: https://freegisdata.rtwilson.com/
- US Labor Statistics: https://www.bls.gov/data/tables.htm
- NOAA climate datasets: https://www.ncdc.noaa.gov/cdo-web/datasets
- United Nations: http://data.un.org/
- Kaggle (filter by file type and data): https://www.kaggle.com/datasets?search=csv+geolocation

NM State Lands data

Download data here: https://www.nmstatelands.org/maps-gis/gis-data-download

Each data set has a link to view metadata and a link to download a .zip folder.

New Mexico State Trust Lands Ownership (by PLSS Subdivision)

Shapefile

Tags

Trust Lands, Surface Ownership, Subsurface Ownership, Beneficiary, New Mexico

Summary

Polygons of New Mexico State Trust Lands by PLSS subdivision (quarter-quarter, lot, tract, or partial).

Description

This data set delineates New Mexico State Trust Lands at the subdivision or parcel level. The data set was built using semi-automated mapping procedures. Land records from the **Land Information Management System (LIMS)** were processed against the BLM Public Lands Survey System (PLSS) grid (CADNSDI Version 2) where it is available or against an alternate source (PLSS Infill or GCDB). Ownership polygons were copied from the PLSS grid. The data is further edited from boundary descriptions present in deeds and plats.

Projection: UTM Zone 13N - NAD83 (meters)

Attributes:

Label: **Meridian**

Definition: Principal meridian

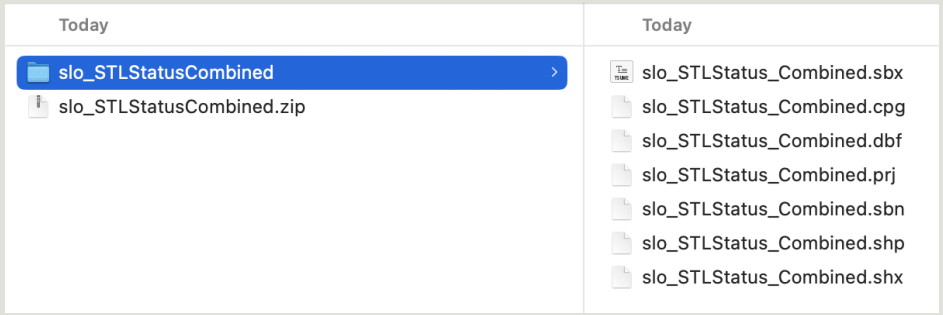
Domain Values:

23: New Mexico principal meridian.

Label: **Township**

Definition: Township, township fraction, and township direction.

The metadata provides further description of the dataset along with an overview of features and attributes.

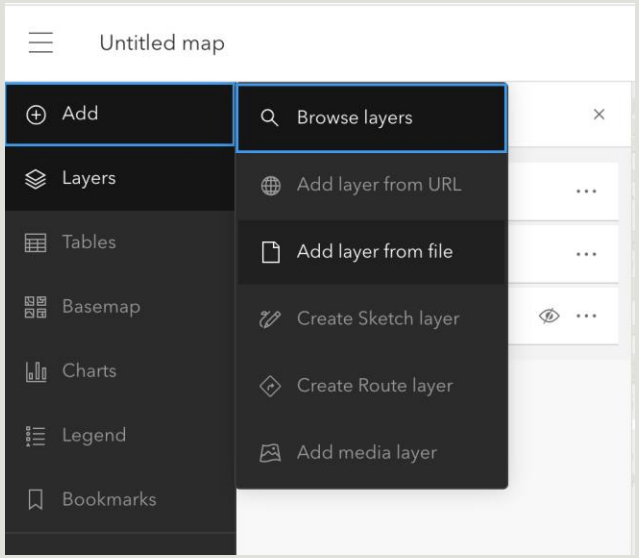


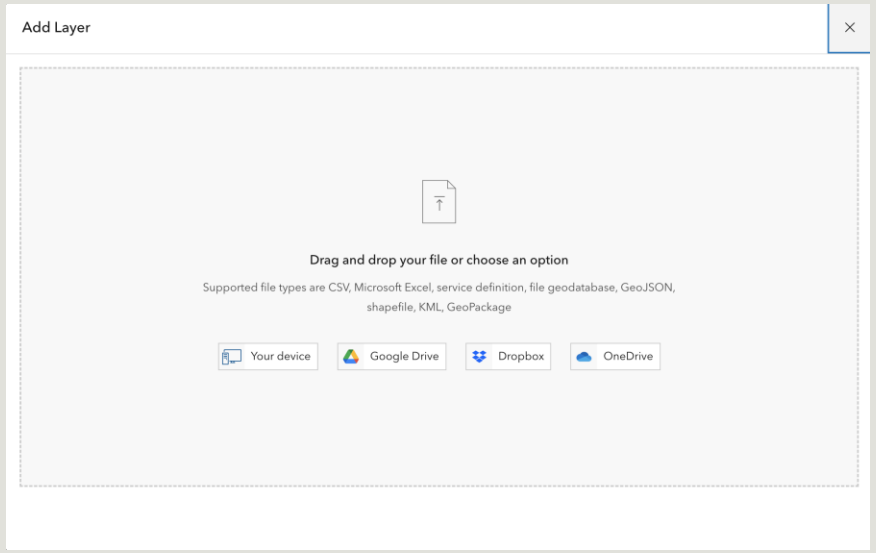
The .zip folder contains the necessary .shp files needed to load the shape on the map layer.

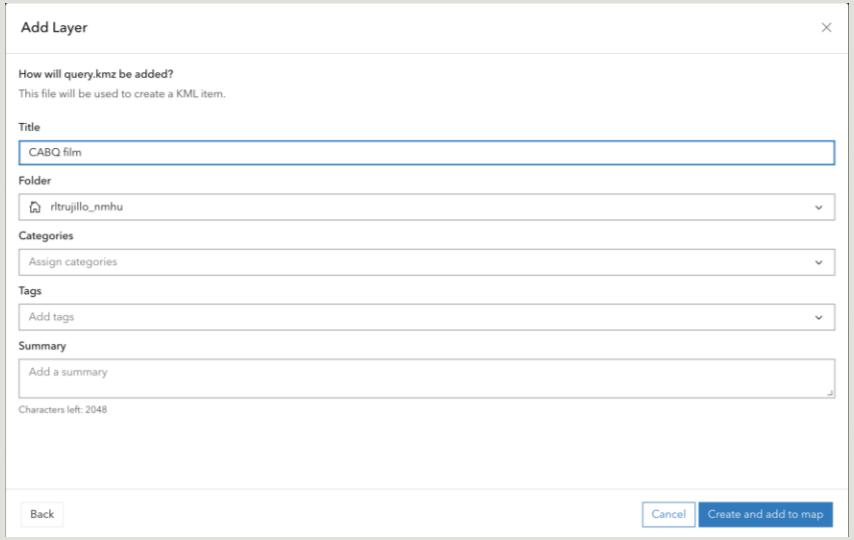
Import data

Upload your CSV, GeoJson, KML/KMZ, Tilelayer urls and host as a feature layer: https://nmhu.maps.arcgis.com/home/content.html

Or select "Add layer from file" in your map. Drag your files to the popup. Name and save.







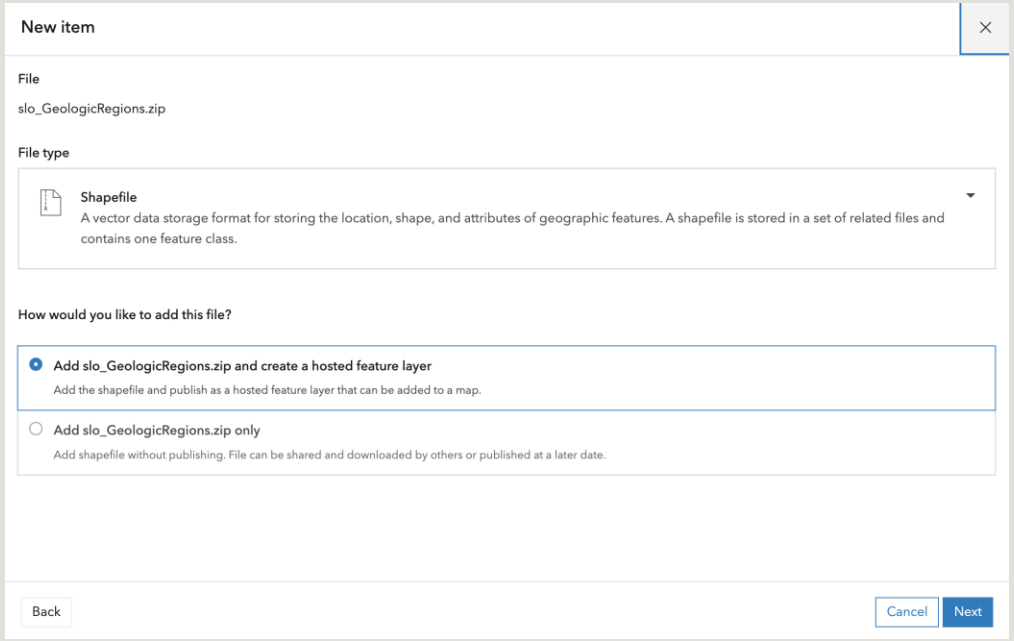
Download:
https://mapservice.nmstatelands.org/GISDataDownloads/ZipFiles/slo_GeologicRegions.zip

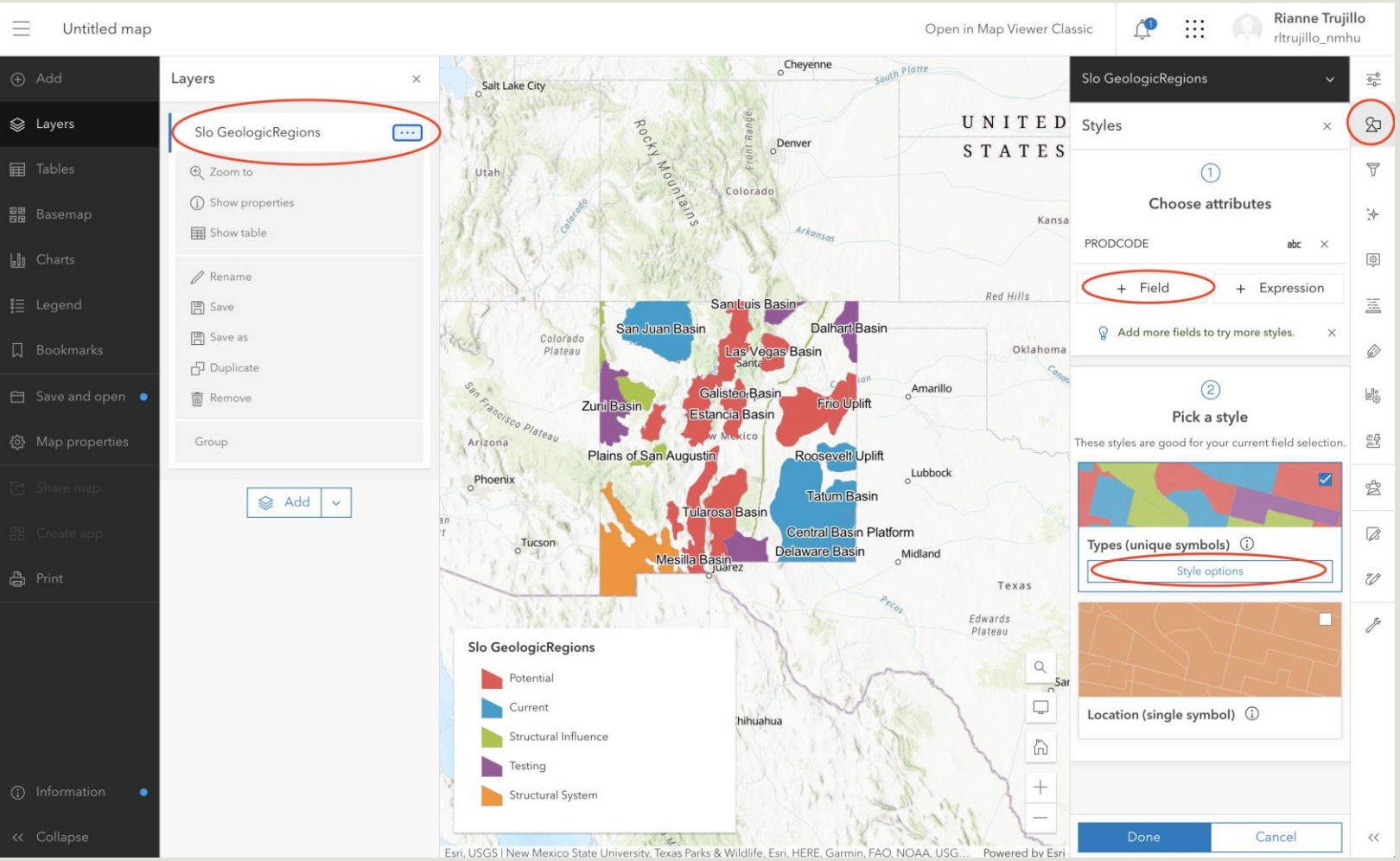
Import Shape File

Shape files should be imported as the .zip folder.

When added through a map layer, the shape file will automatically be added as hosted feature layer.

If adding from the "Content" menu, ensure that you select the "hosted as feature layer" option so that you can access in your map



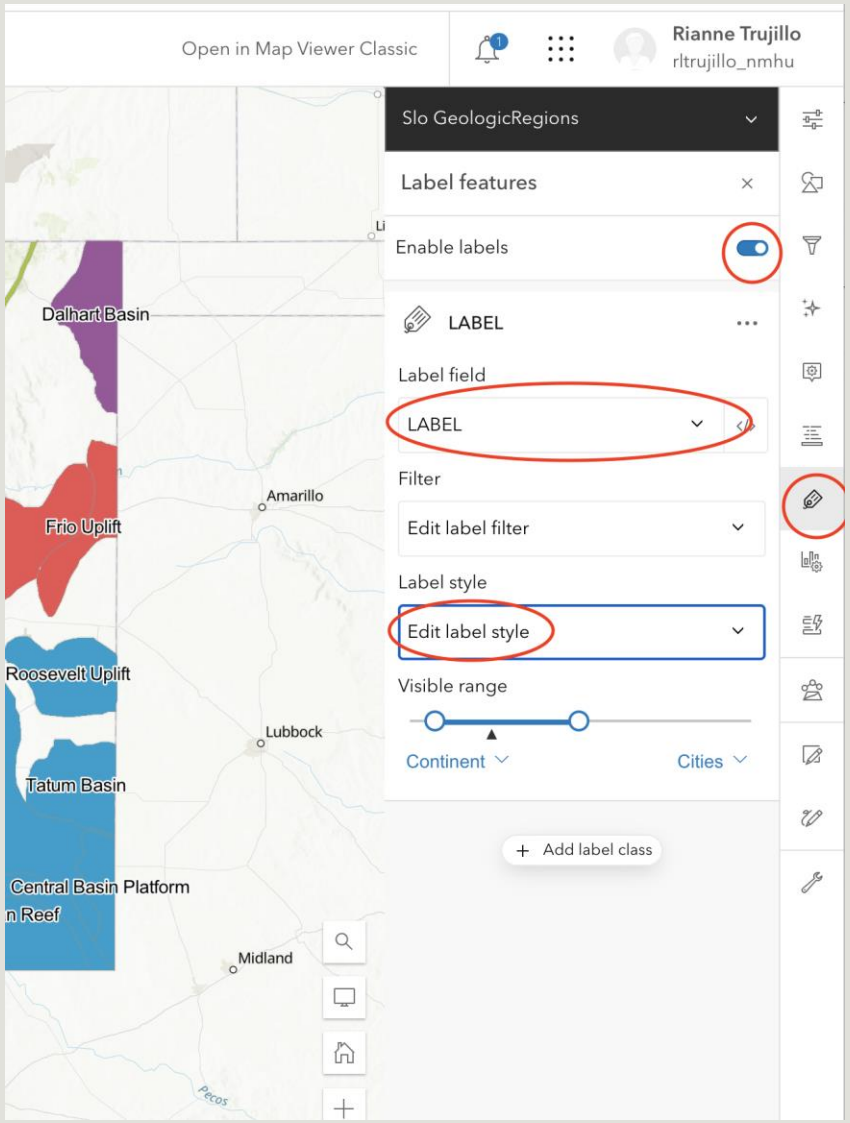


Style the Layer

Once imported as a layer, select the style icon in the right side menu.

You can choose a field to style the shapes. In this data set, I use the PRODCODE field. Any field I select, will automatically create a legend.

Select style options to adjust colors



Edit the labels

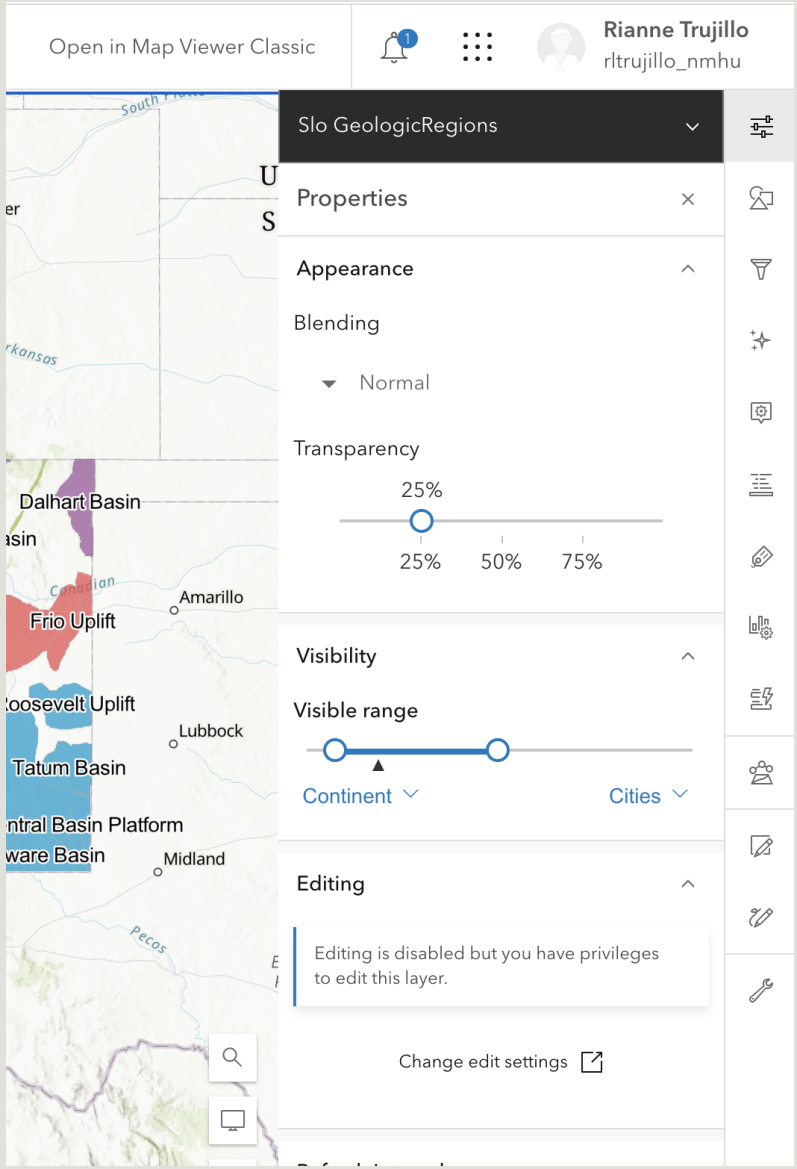
Select the label icon in the right side menu.

Ensure that labels are toggled on

You can choose a field that has label data

Select Edit label style to change font color and size.

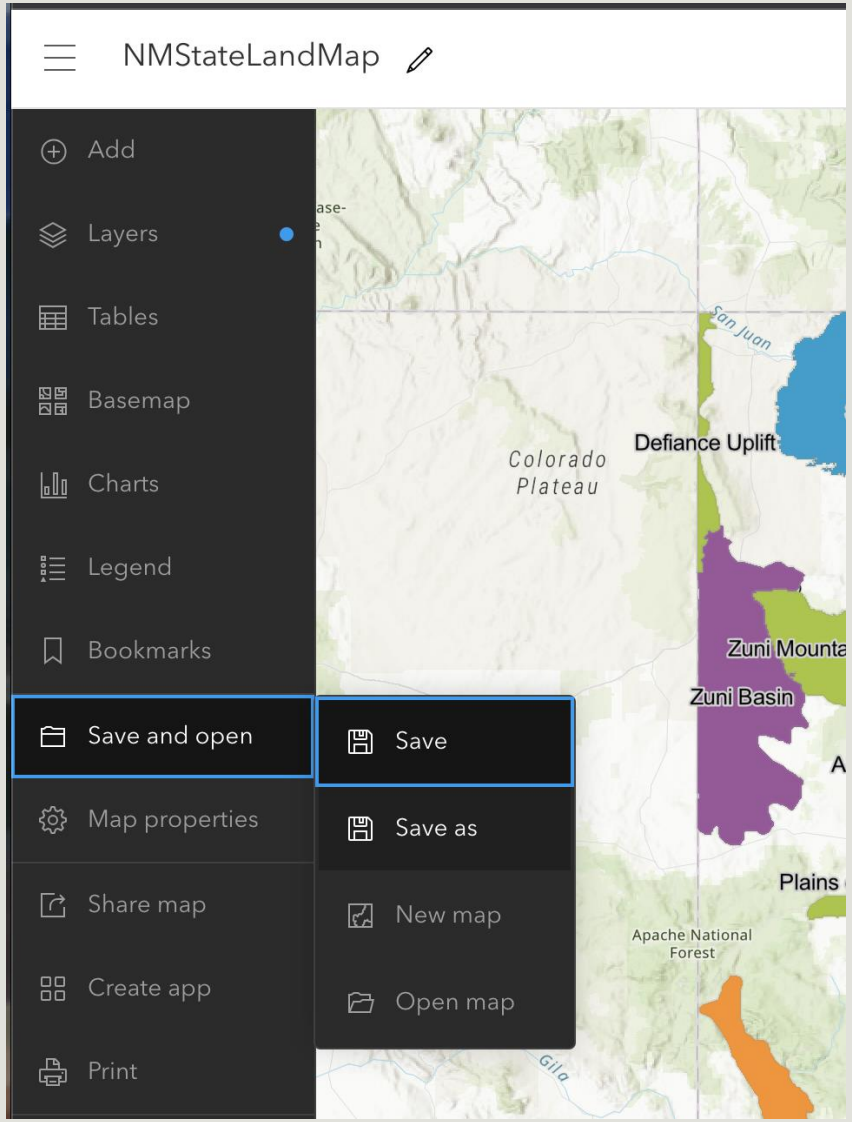
Use the visible range slider to adjust the zoom levels that show the label feature



Adjust layer properties

Use the transparency slider to adjust the shape transparency

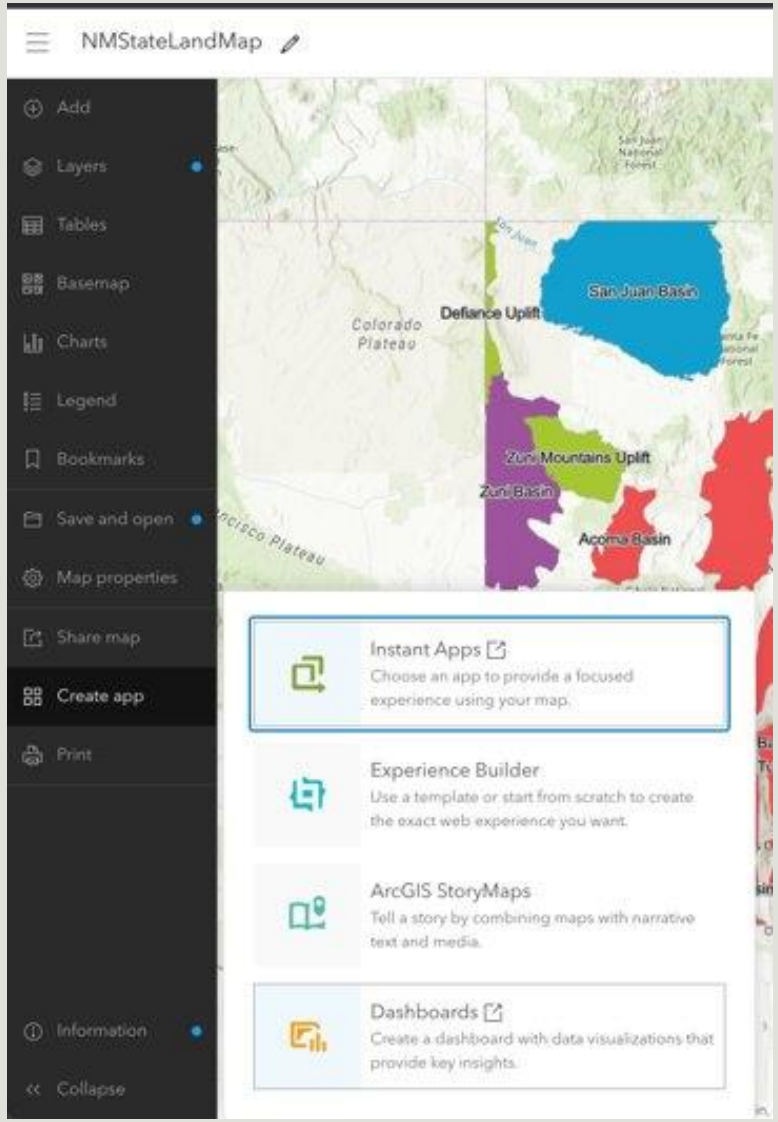
Use the visible range slider to adjust the zoom levels that show the layer



Save your map

Once you create your layers, make sure to save!

Saving your map will allow you to use the layers in other applications.



Create an App

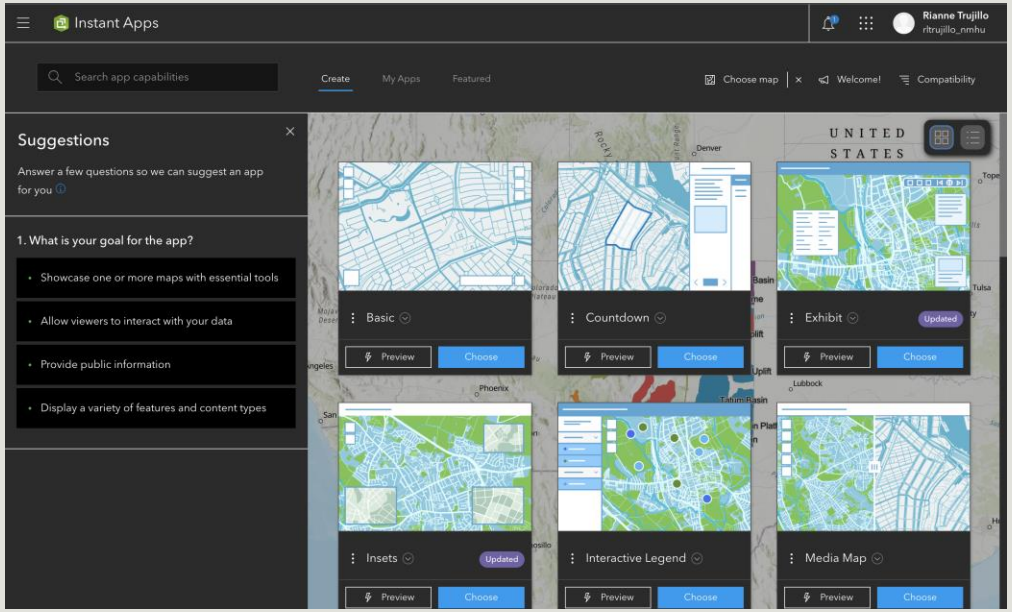
Choose from the following:

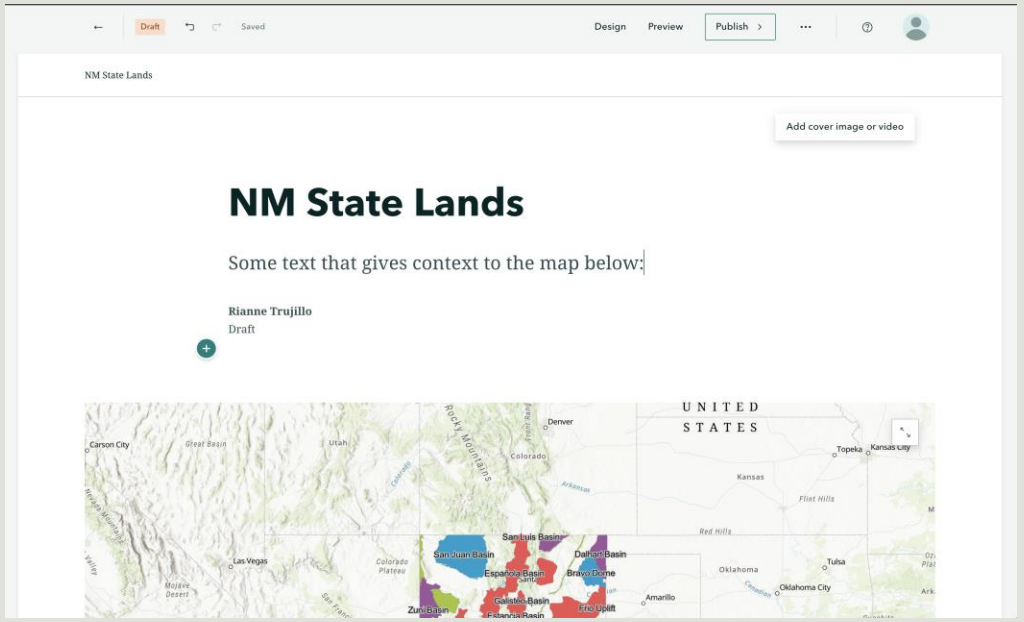
– Instant App (experience templates for web apps)

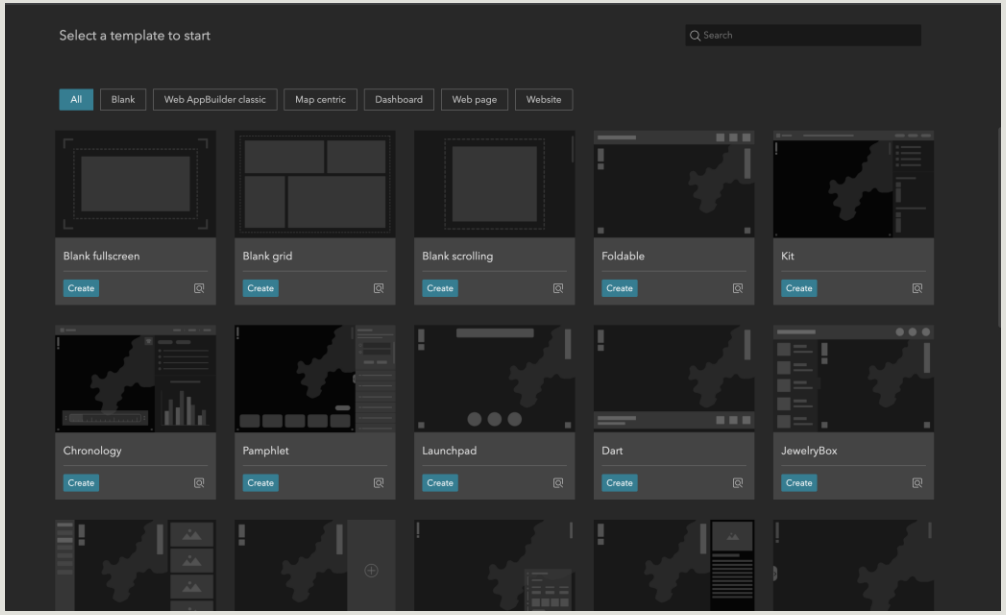
– Experience Builder (general starter templates)

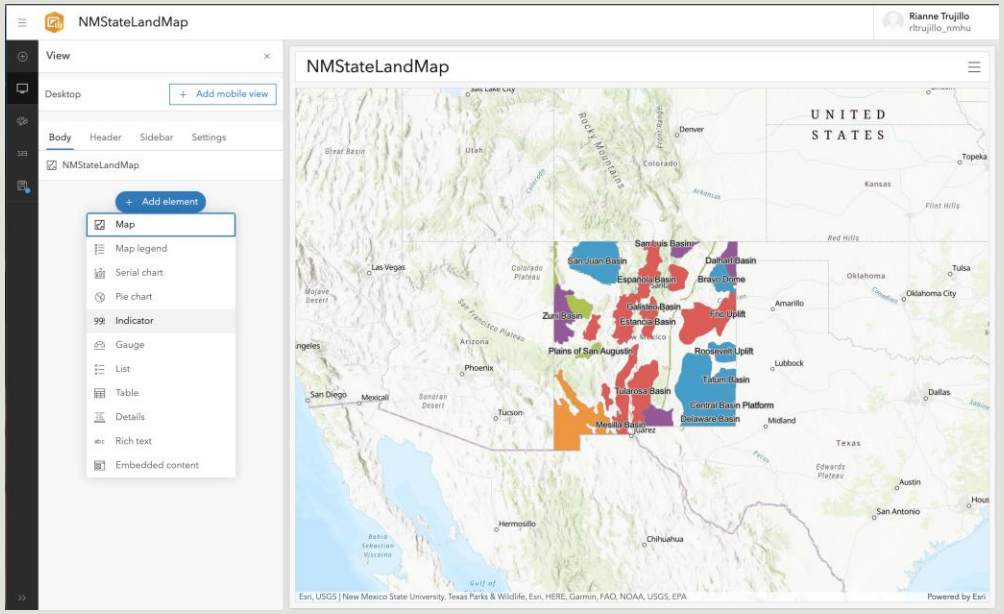
– StoryMap (blog post)

– Dashboard (simple webpage with focus on analytics widgets)


Instant Apps
Rianne Trujillo
rltrujillo_nmhu
Search app capabilities
Create
My Apps
Featured
Choose map
Welcome!
Compatibility
Suggestions
Answer a few questions so we can suggest an app for you
1. What is your goal for the app?
Showcase one or more maps with essential tools
Allow viewers to interact with your data
Provide public information
Display a variety of features and content types
Basic
Countdown
Exhibit
Updated
Insets
Interactive Legend
Media Map
Preview
Choose
UNITED STATES


Draft
Saved
Design
Preview
Publish
NM State Lands
Add cover image or video
NM State Lands
Some text that gives context to the map below:
Rianne Trujillo
Draft
UNITED STATES


Select a template to start
Search
All
Blank
Web AppBuilder classic
Map centric
Dashboard
Web page
Website
Blank fullscreen
Blank grid
Blank scrolling
Foldable
Kit
Chronology
Pamphlet
Launchpad
Dart
JewelryBox
Create


NMStateLandMap
Rianne Trujillo
rltrujillo_nmhu
View
Desktop
Add mobile view
Body
Header
Sidebar
Settings
NMStateLandMap
Add element
Map
Map legend
Serial chart
Pie chart
Indicator
Gauge
List
Table
Details
Rich text
Embedded content
NMStateLandMap
UNITED STATES