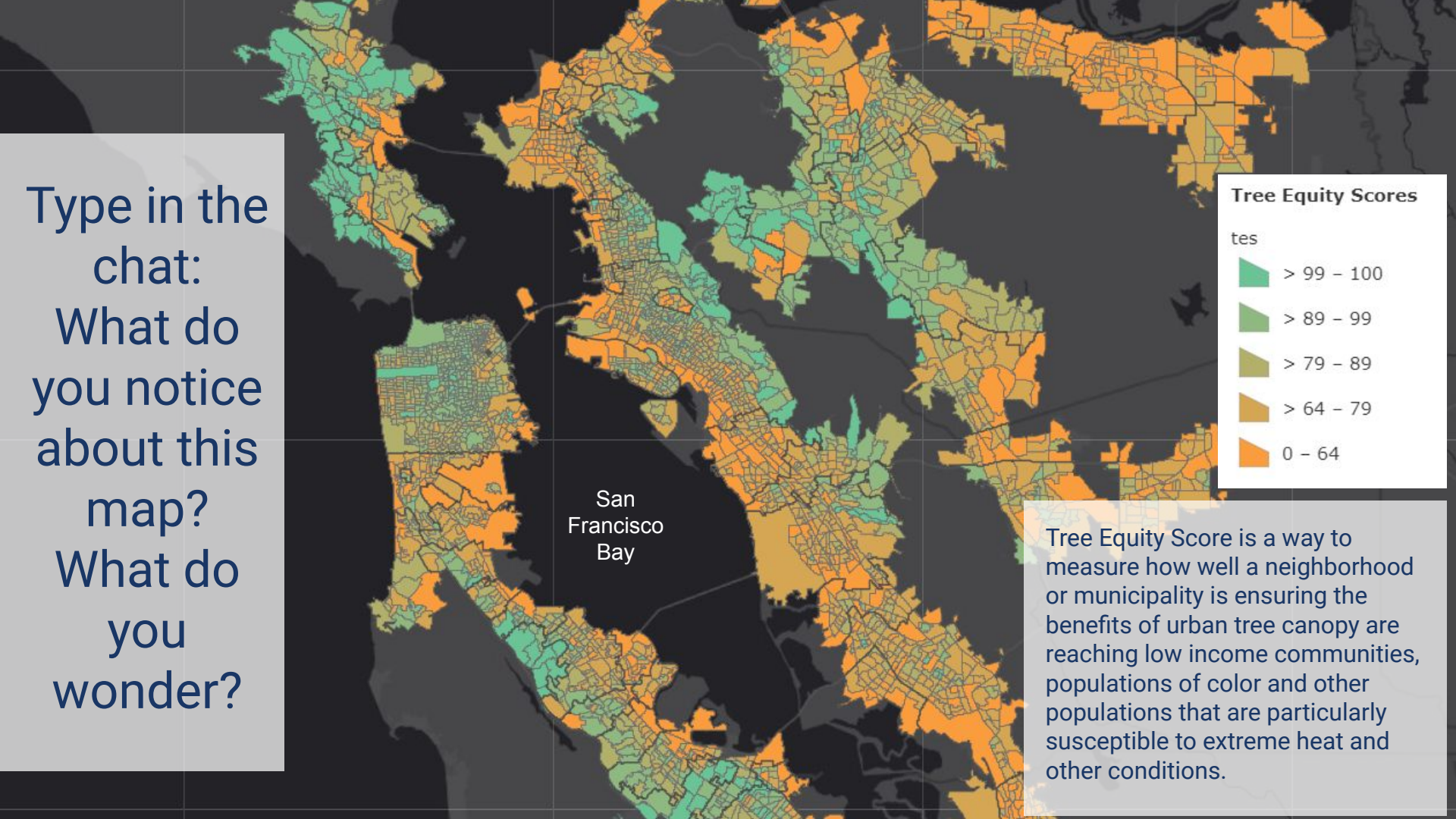
Type in the chat: What do you notice about this map? What do you wonder?



Tree Equity Score is a way to measure how well a neighborhood or municipality is ensuring the benefits of urban tree canopy are reaching low income communities, populations of color and other populations that are particularly susceptible to extreme heat and other conditions.

March 31 2021

Mapping for Spatial & Environmental Literacy

Hana Moidu, *PhD Candidate, Department of Environmental Science, Policy, Mgmt, UC Berkeley*

Sarah Pedemonte, *Learning and Teaching Group, The Lawrence, UC Berkeley*

Betsy Mitchell, *PhD, Science Content Specialist, UC Berkeley Natural Museums*

Joanna Totino, *Director Bay Area Science Project, The Lawrence, UC Berkeley*

The Lawrence Hall of Science
UNIVERSITY OF CALIFORNIA, BERKELEY

Berkeley
UNIVERSITY OF CALIFORNIA

COMMUNITY RESOURCES FOR SCIENCE

Feedback from Tuesday

Gots	Needs
● What spatial data is ● The power of mapping ● Lots of possibilities with Survey123 ● New tools and ideas	● Presentation Slides ● Access to sources of data ● More information on ArcGIS ● How to create my own map or survey ● How to help my students use these tools

Goals of this webinar:

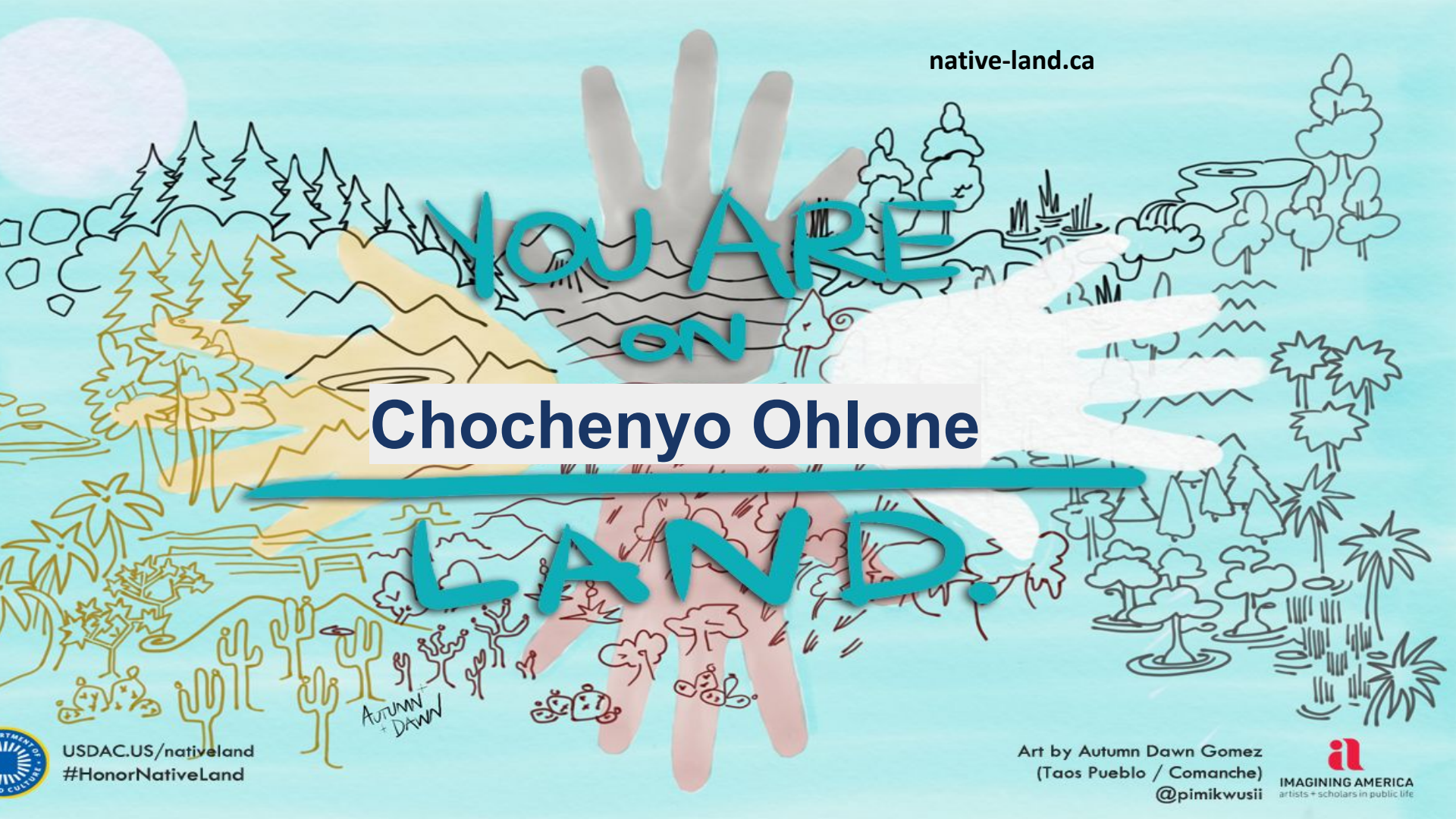
1. Access existing spatial data
2. Visualize spatial data on ArcGIS
3. Analyze spatial data on ArcGIS

Group Agreements

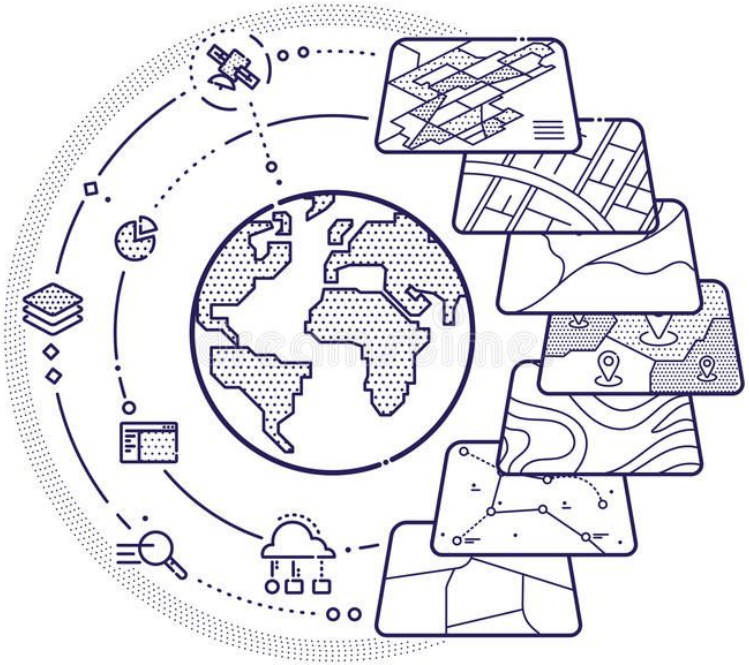
- Take space/make space
- Presume positive intentions, and take responsibility for your impact
- Stay curious and ask questions

- Mute when you are not talking
- Keep your camera ON whenever possible

native-land.ca



There are many creative ways to ask environmental and social justice questions using spatial data

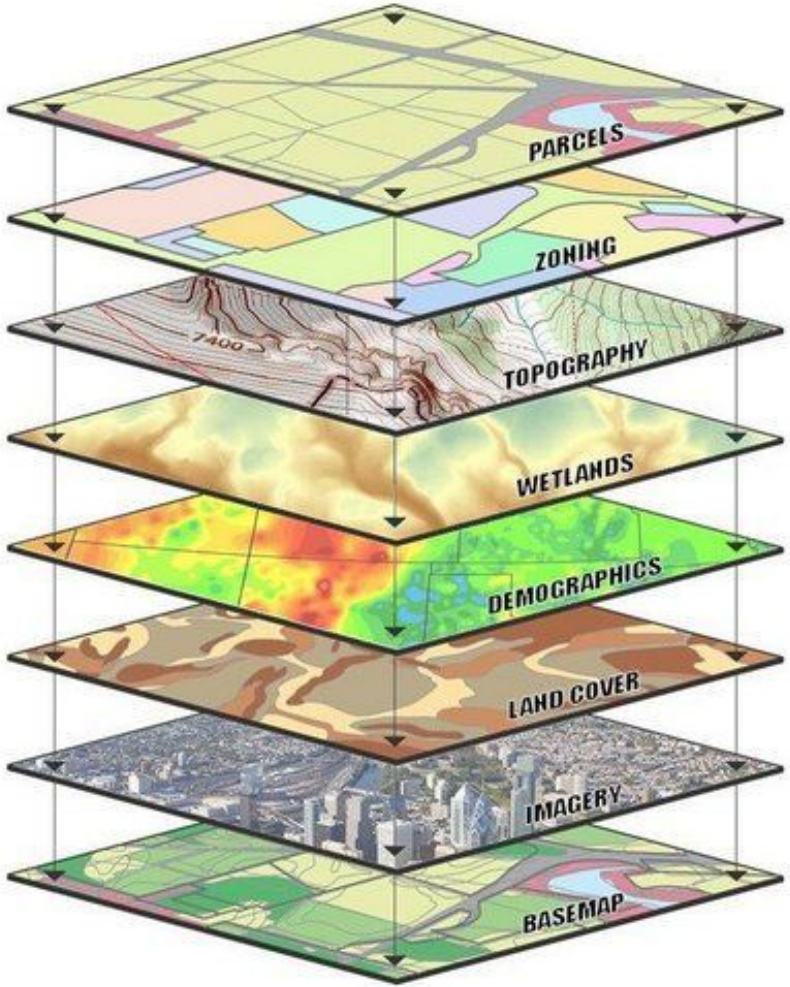


Accessing, visualizing, and analyzing existing spatial data is an important part of telling stories using maps

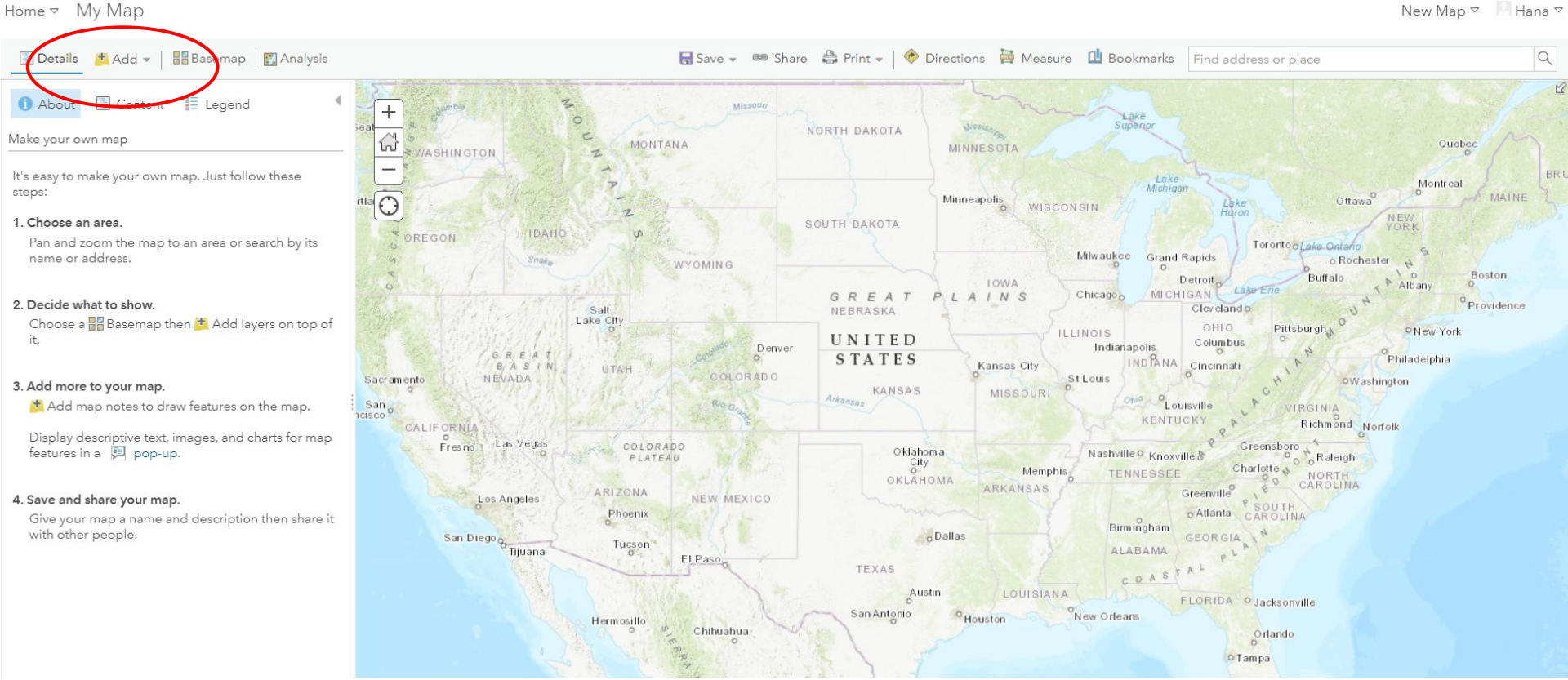
Throughout this presentation, keep in mind possible questions you want to explore with your students!

1. Access existing spatial data

- Many different types of data can be represented as individual map layers
- Each layer holds one category of information (land cover, demographics, zoning)
- When these layers are drawn on top of one another, spatial trends and relationships can often emerge

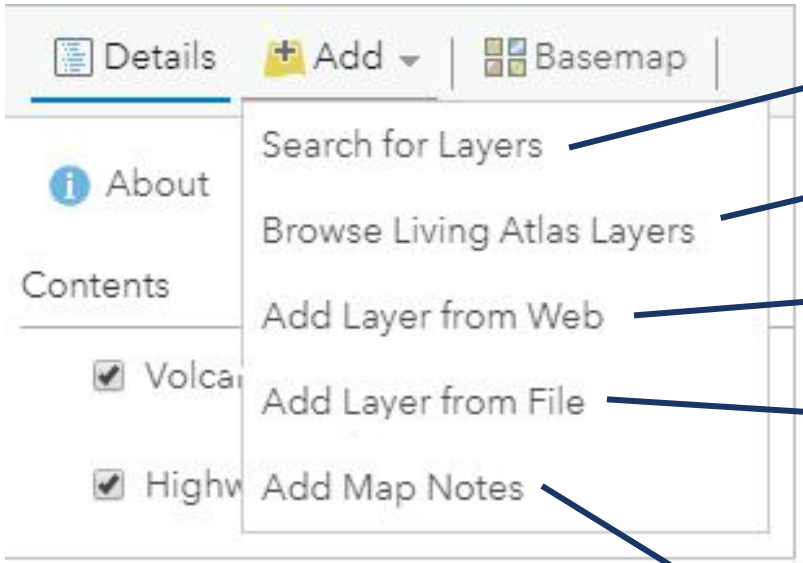


1. Access existing spatial data



You can access existing spatial layers through the mapping interface of ArcGIS Online

1. Access existing spatial data



Data from your content

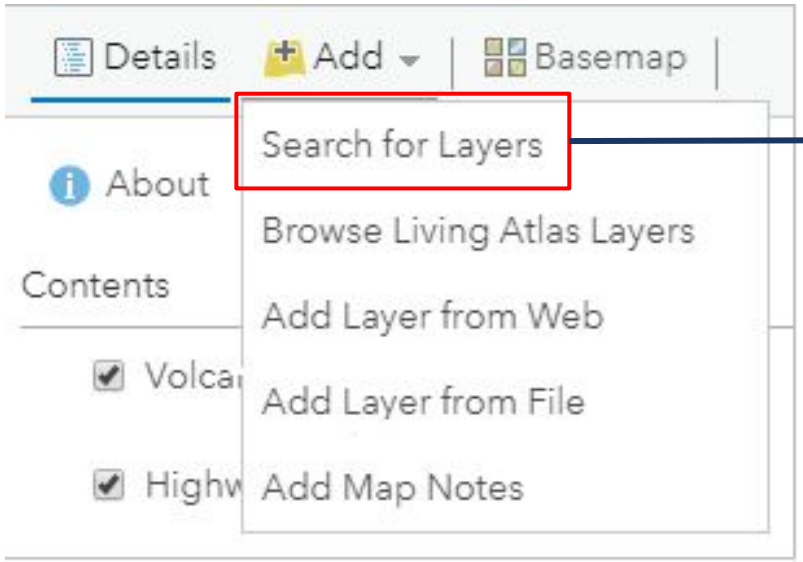
Existing data published in ArcGIS

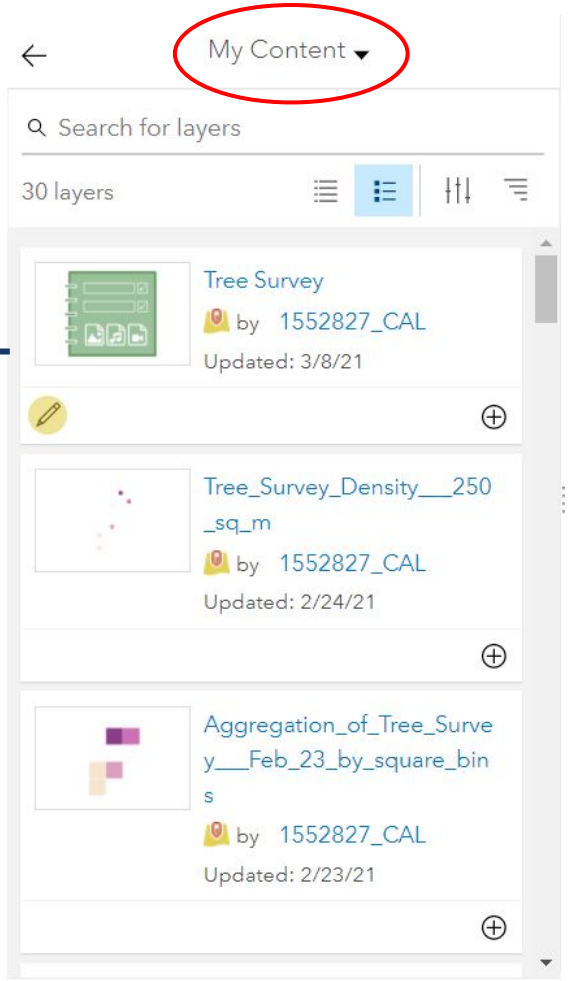
Data linked through a web service

Local data from a file
(eg .csv with coordinate locations)

Create your own features on the map in real time

1. Access existing spatial data





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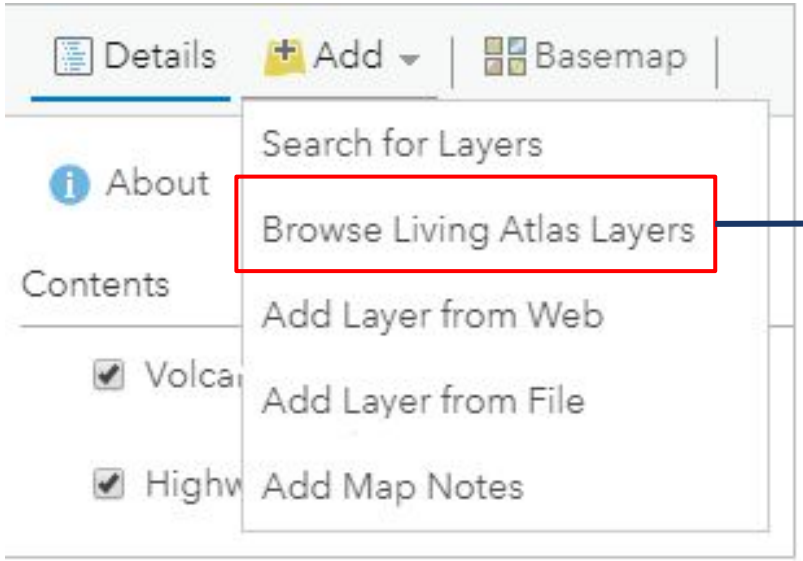
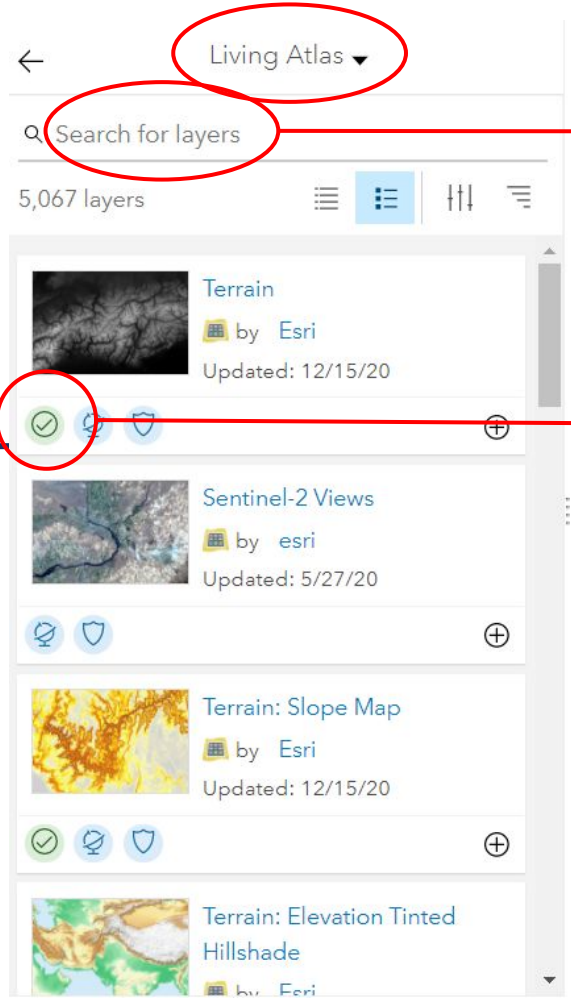
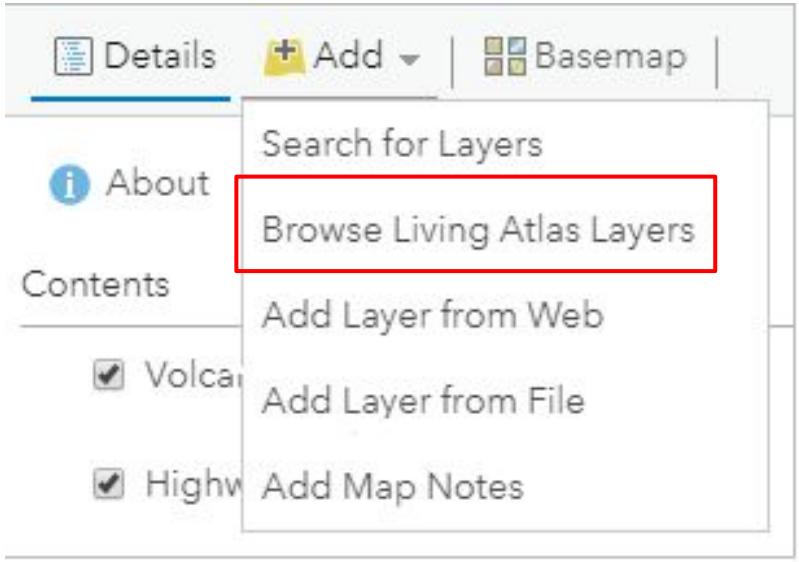


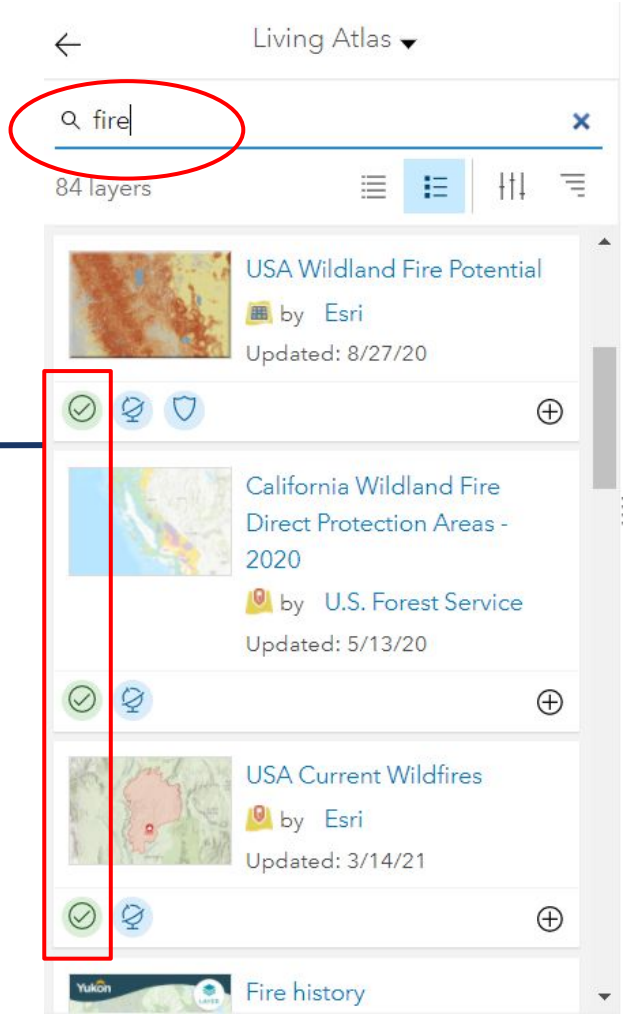


Search for any key words

Green check = authoritative data (trusted)

1. Access existing spatial data





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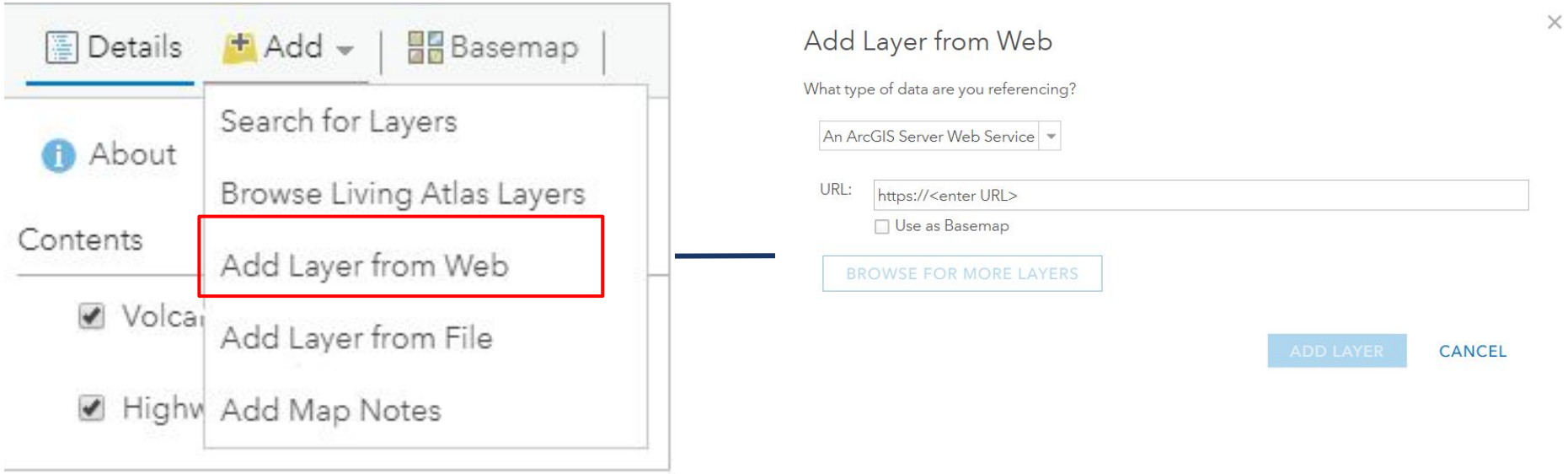

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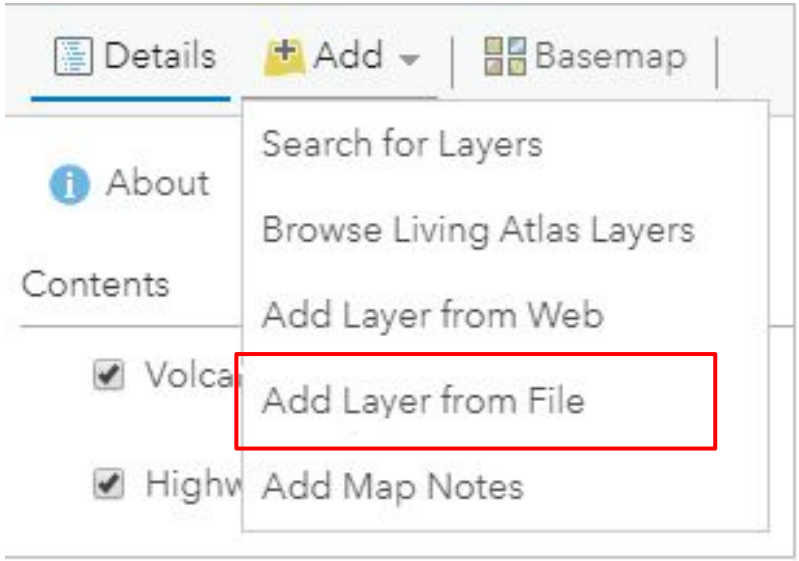

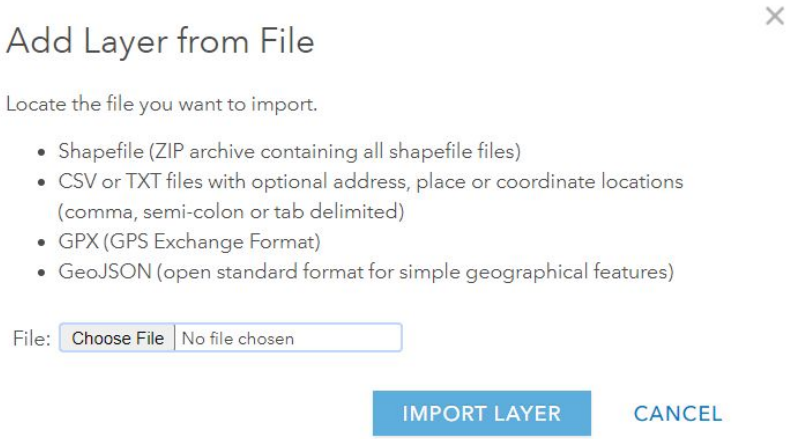

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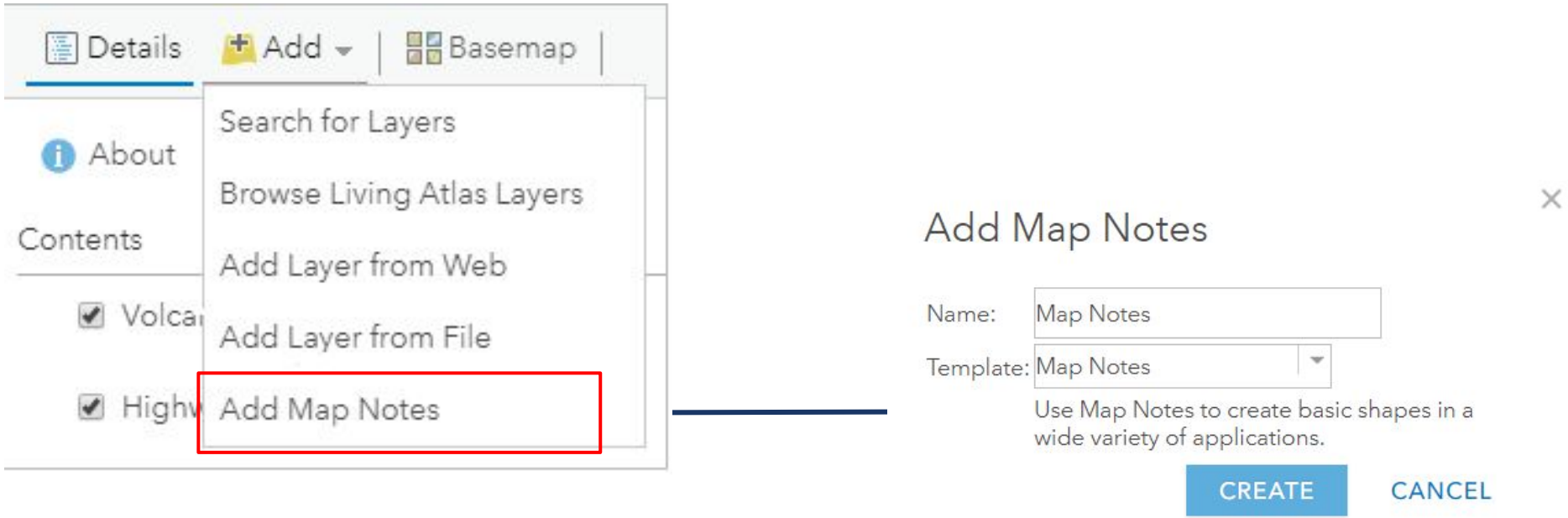
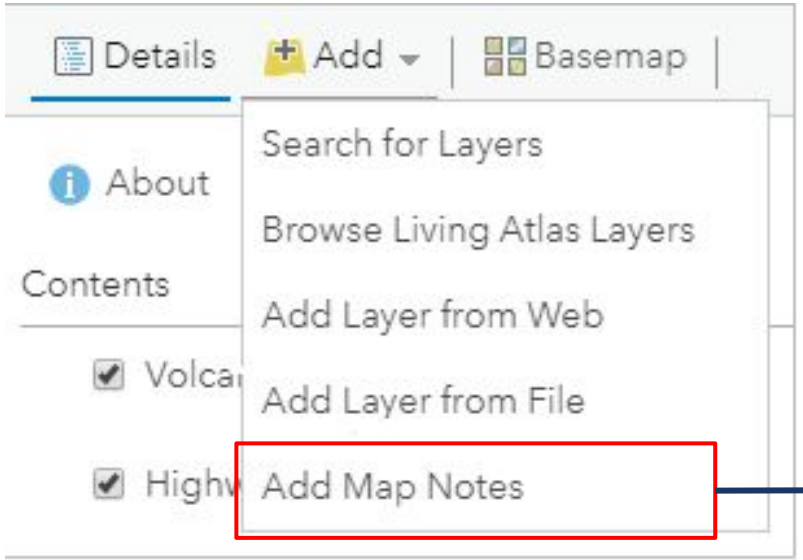
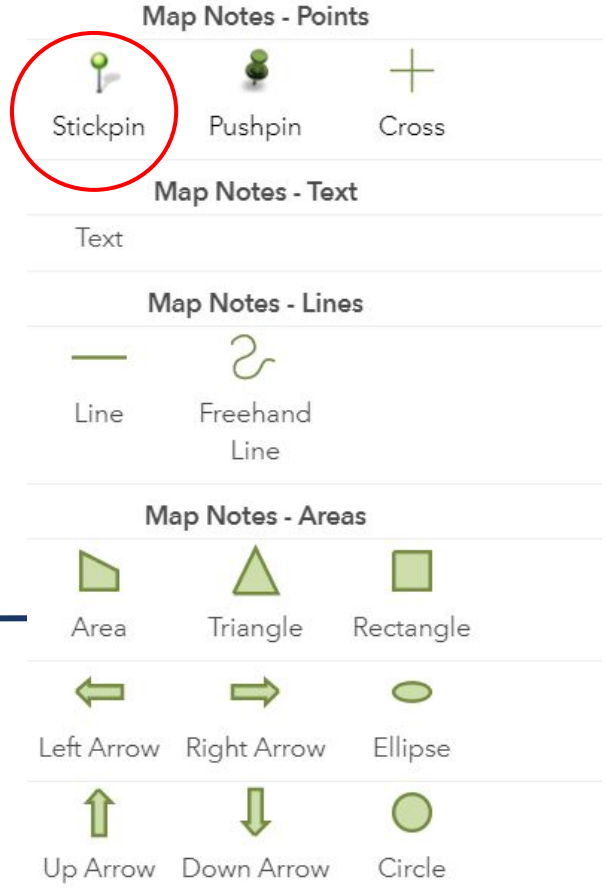


Create points, lines, and polygons directly on the map. Similar to Google MyMaps!

1. Access existing spatial data





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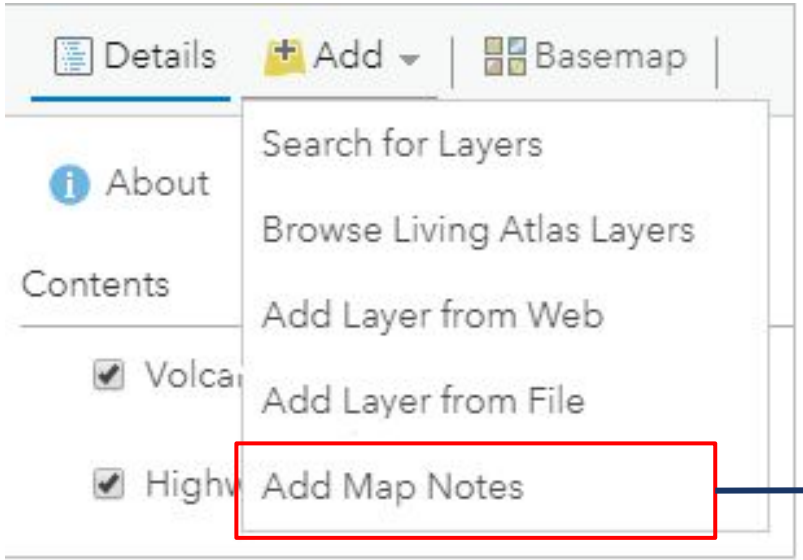
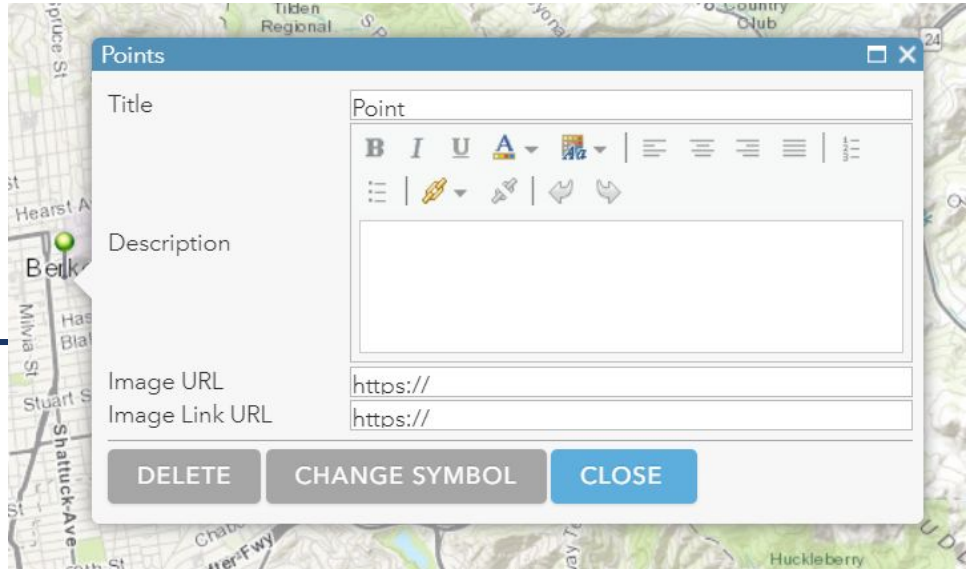
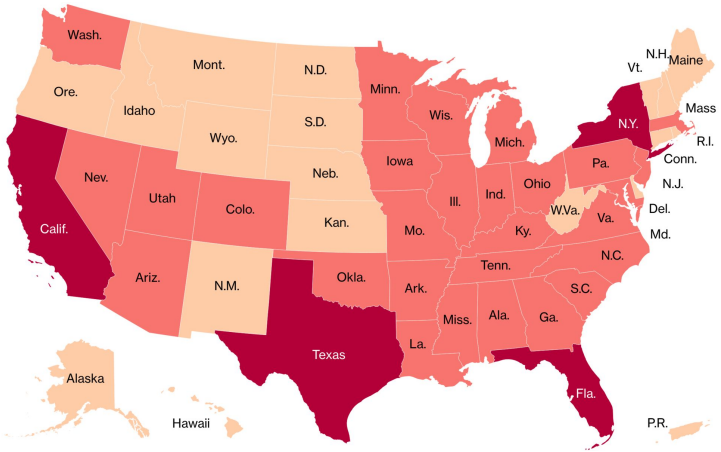
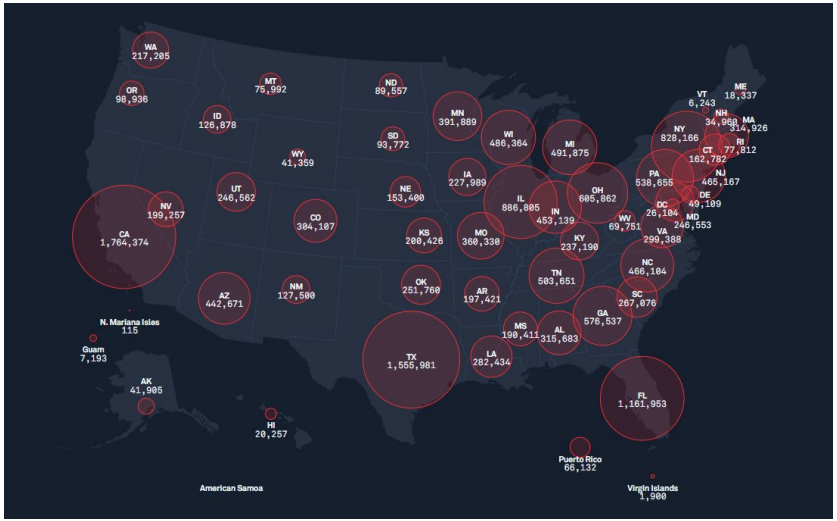




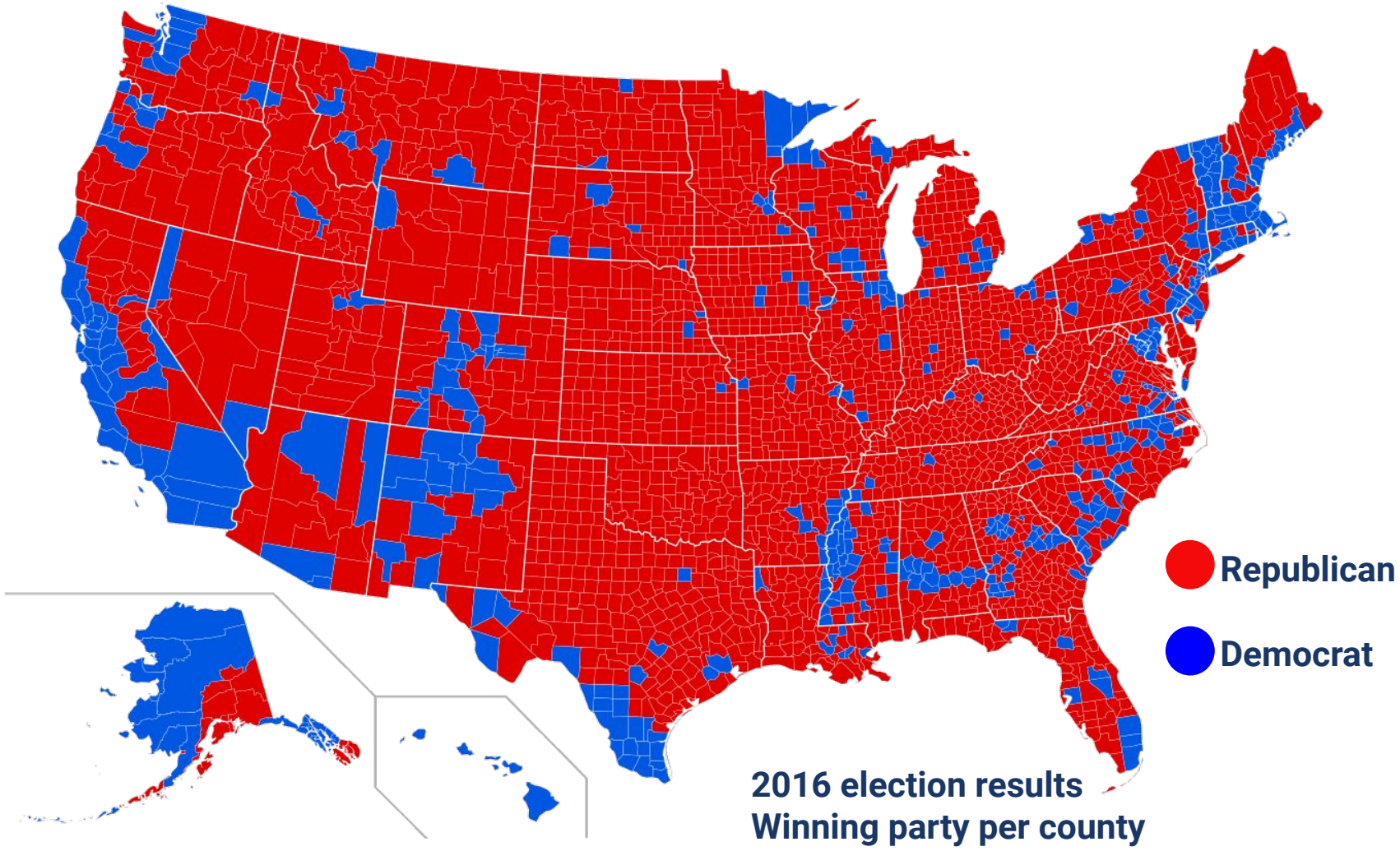
2. Visualize spatial data on ArcGIS

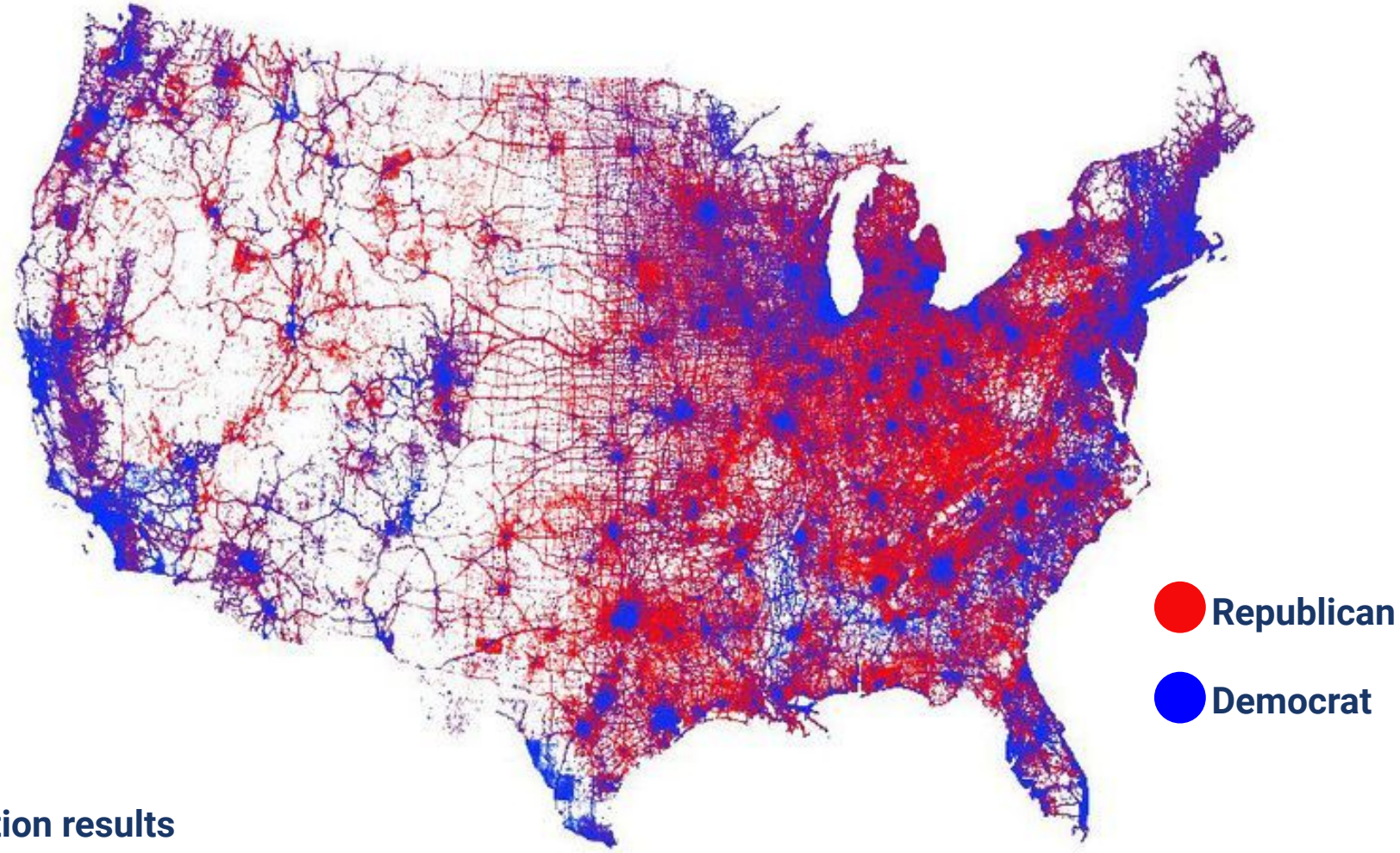
- Maps allow you to visualize your data in a variety of ways
- Population data for countries can be visualized as
  - a sequence of colors, such as from light to dark
  - or as proportional circles, such as from small to large
- This flexibility allows you to tell different stories and discover hidden patterns depending on how the data is presented





Two different ways to visualize COVID-19 data

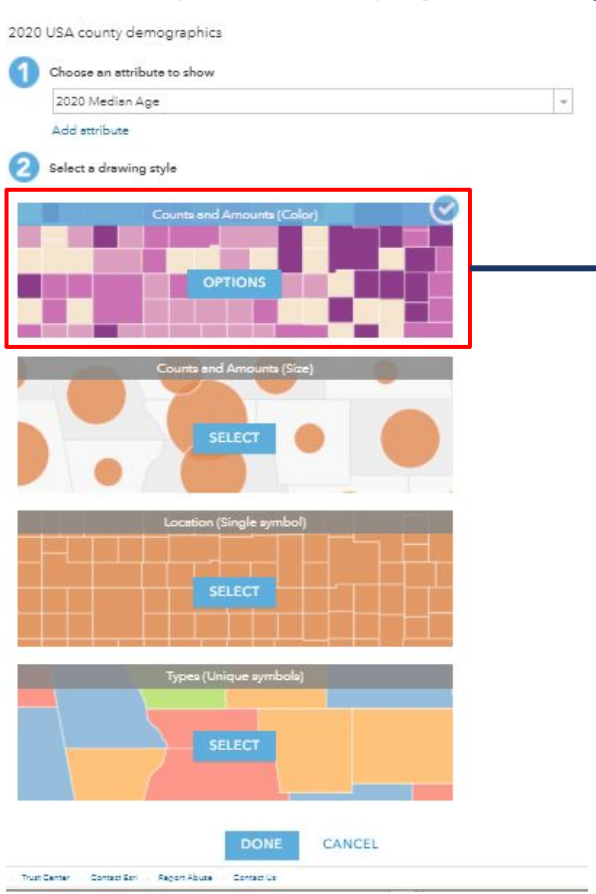

Republican
Democrat
2016 election results
Winning party per county

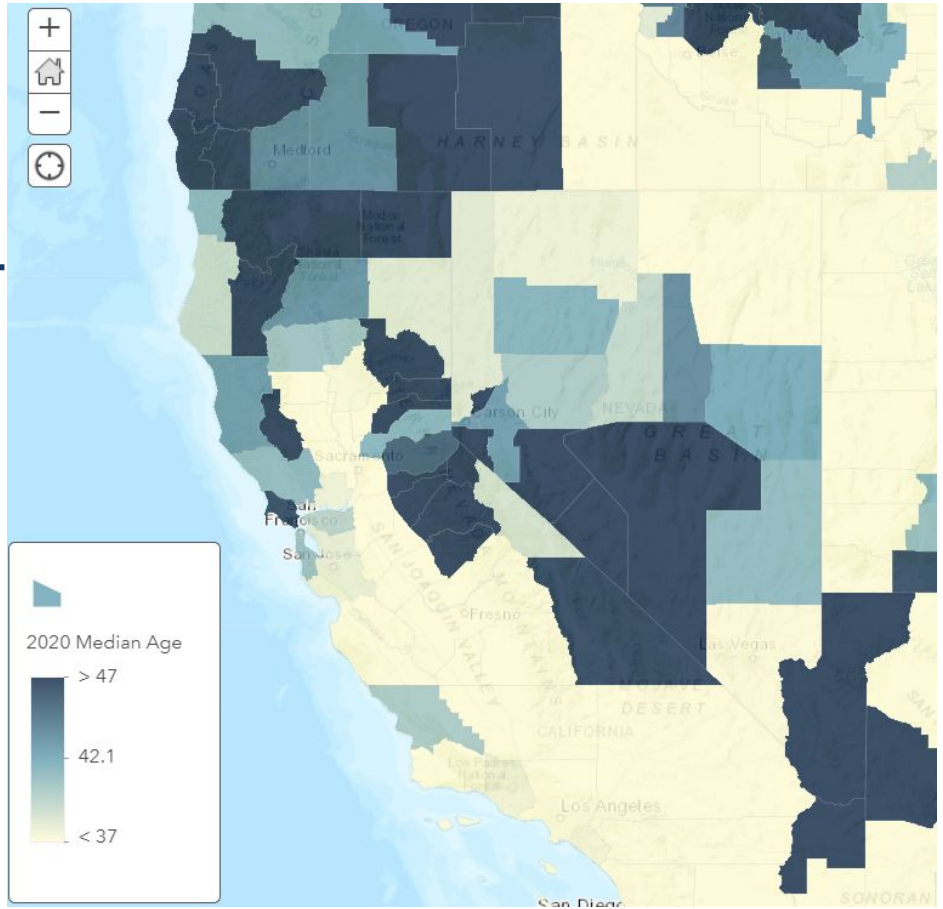


2016 election results
Each vote = 1 point on the map

2. Visualize spatial data on ArcGIS

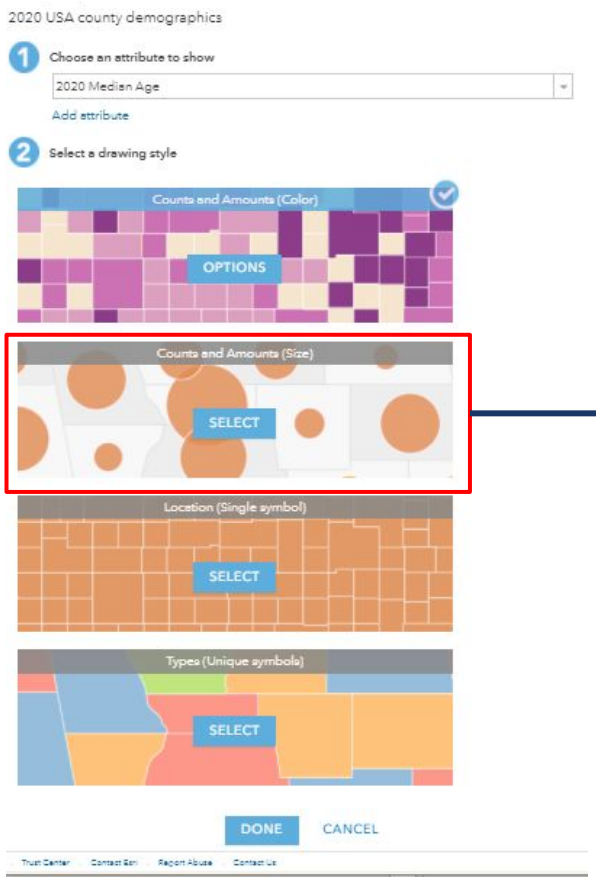
Visualizing median age per county

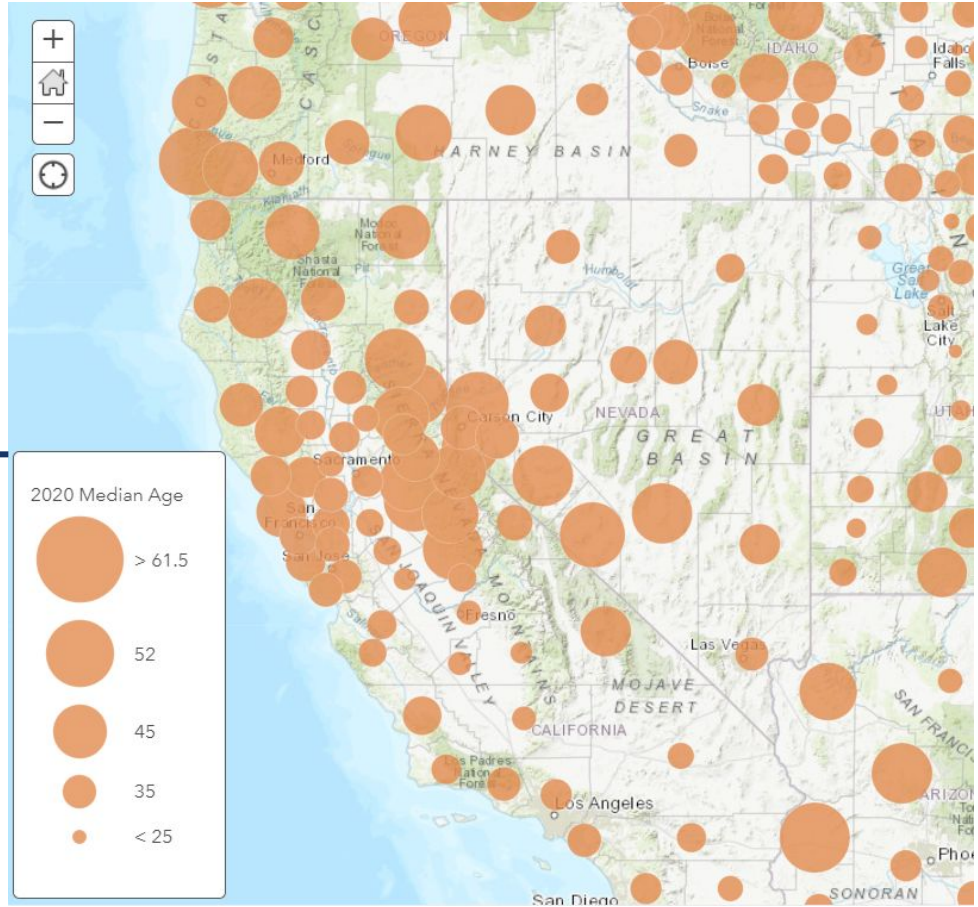




2. Visualize spatial data on ArcGIS

Visualizing median age per county





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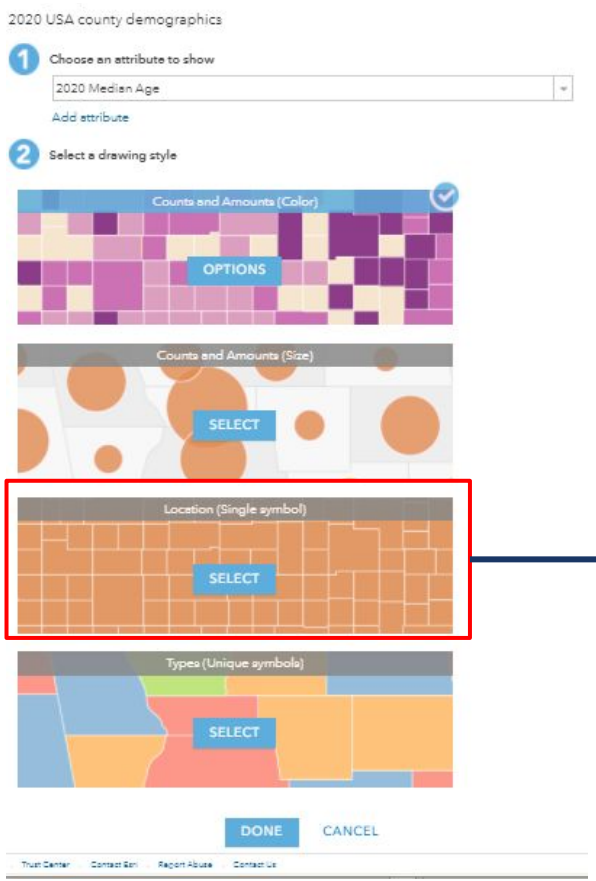
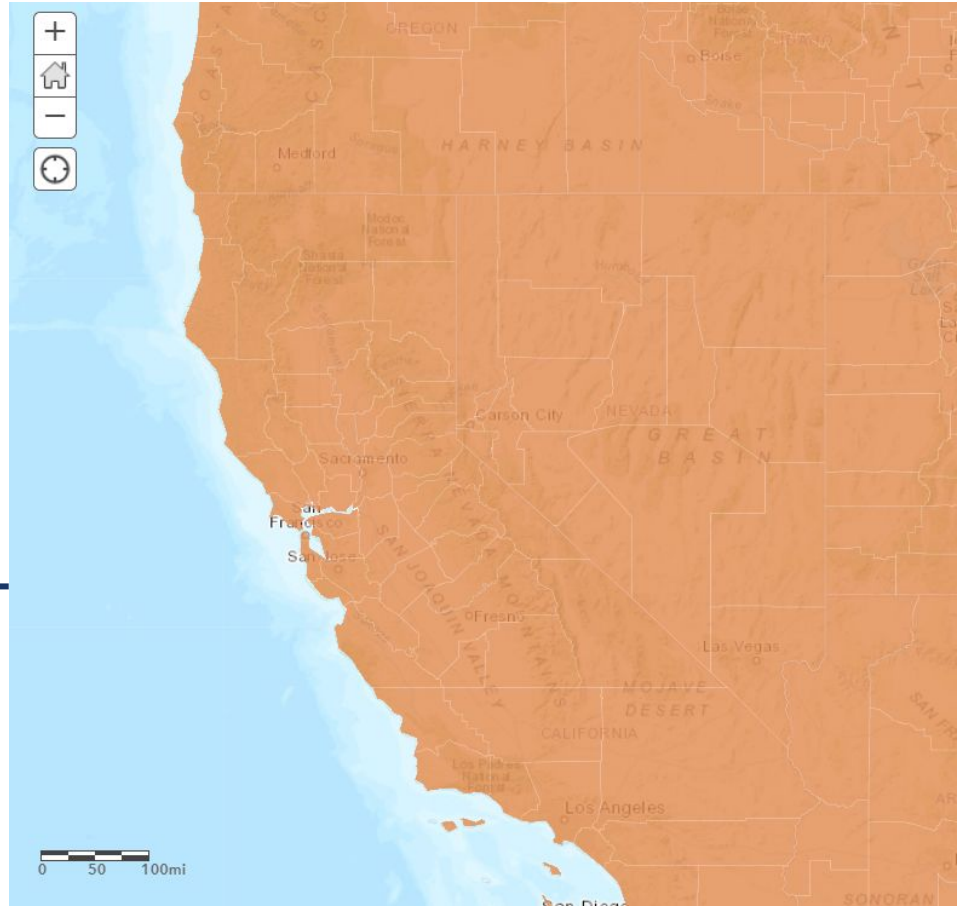
Visualizing median age per county





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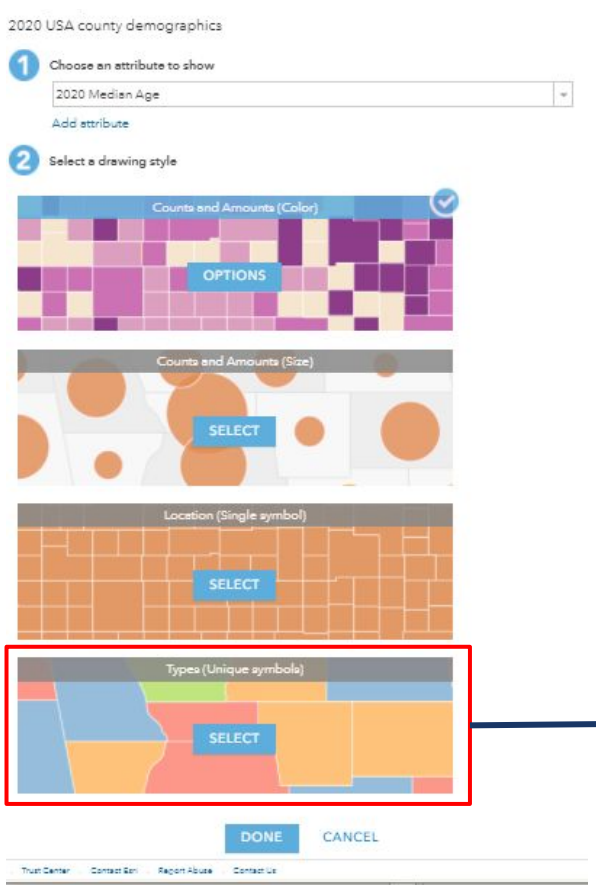
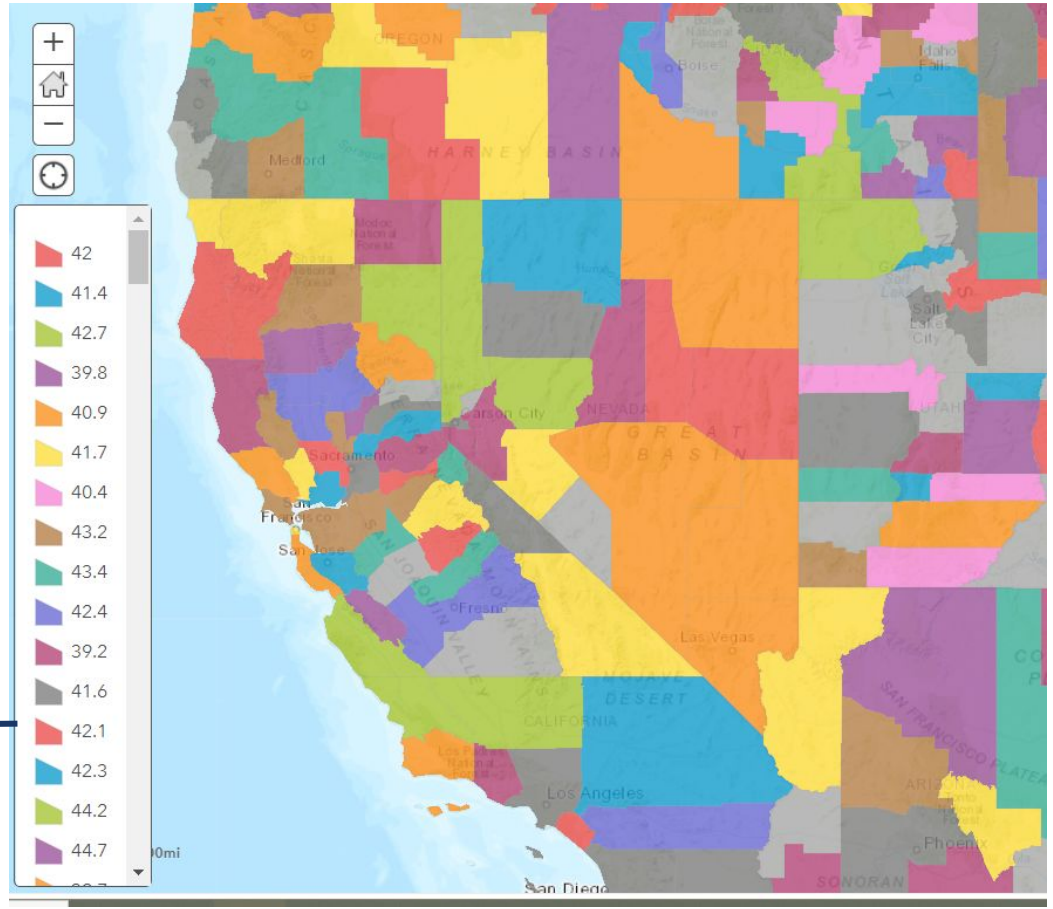
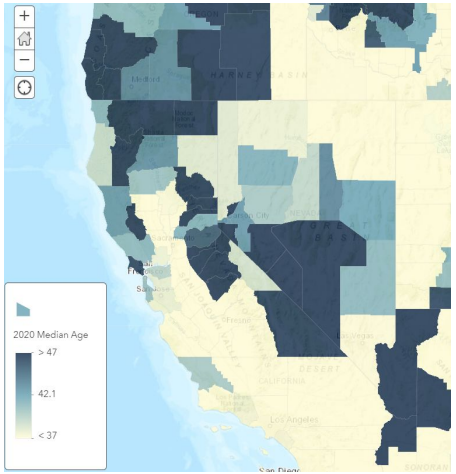
Visualizing median age per county



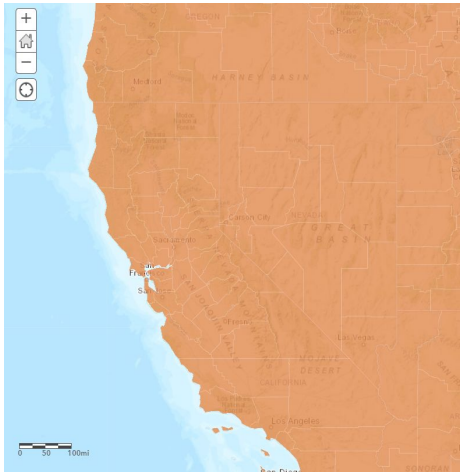


2. Visualize spatial data on ArcGIS

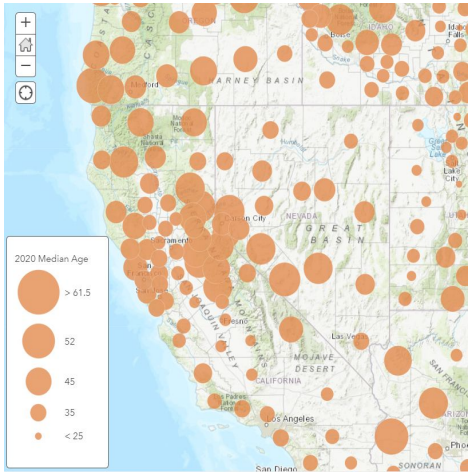
Visualizing median age per county



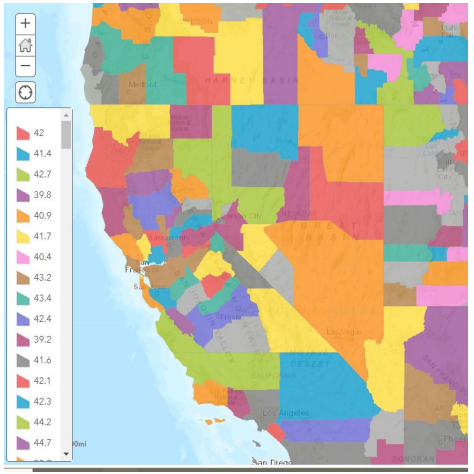
Option 1



Option 2



Option 3



Option 4

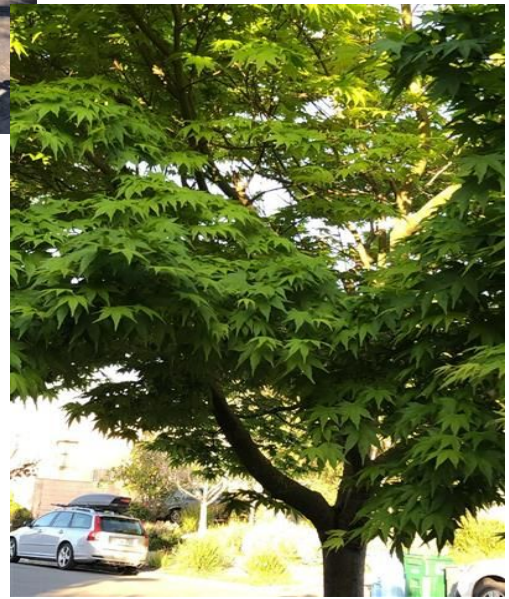
Which option is best? Why?

Example tutorial using data YOU collected!

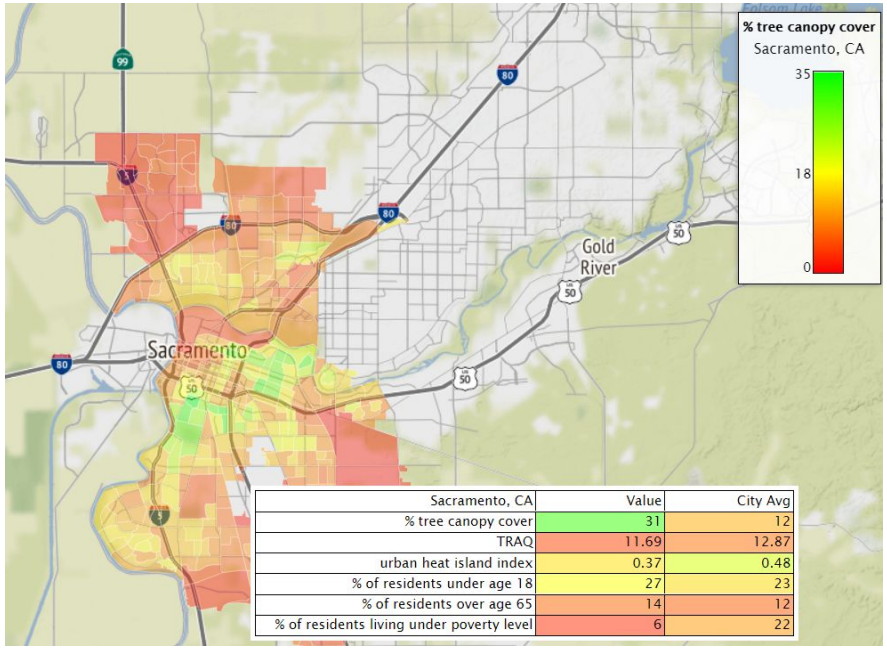
What we have:

- **Location of tree**
- **Type of tree**
- **Approx height of tree**

What would you be interested in analyzing with this data?
What additional data would we need to address that question?



Examples of using tree density data in municipal decisions



Sacramento, CA	Value	City Avg
% tree canopy cover	31	12
TRAQ	11.69	12.87
urban heat island index	0.37	0.48
% of residents under age 18	27	23
% of residents over age 65	14	12
% of residents living under poverty level	6	22

By John Metcalfe,
March 11, 2021, 3:41 p.m.

New map shows which neighborhoods have the most, and the fewest, trees

Wealthier neighborhoods are leafier and hence healthier, but a new tree-planting program is on the way.

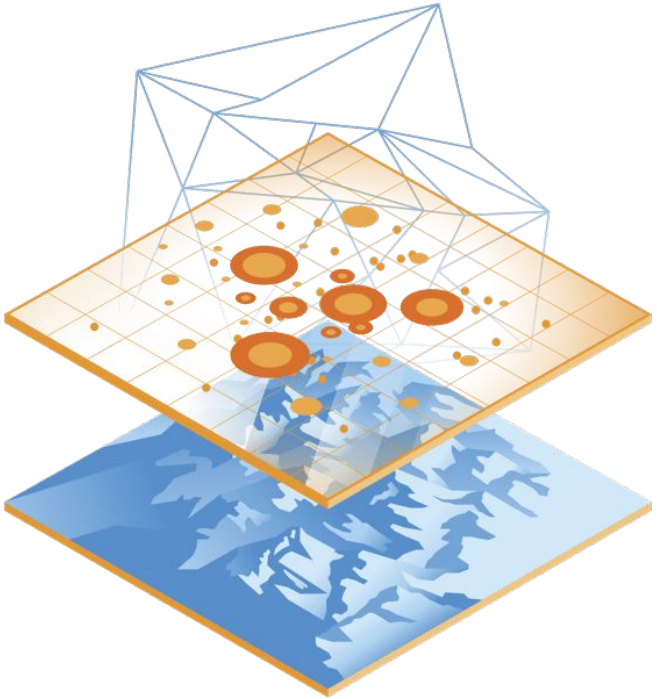
BREAKOUT ROOM

In your small group:

1. **What environmental or social justice questions could you ask with your class?**
2. **What data would you need to answer that question?**
3. **Be ready to share out with the whole group**

3. Analyze spatial data on ArcGIS (organizational account only)

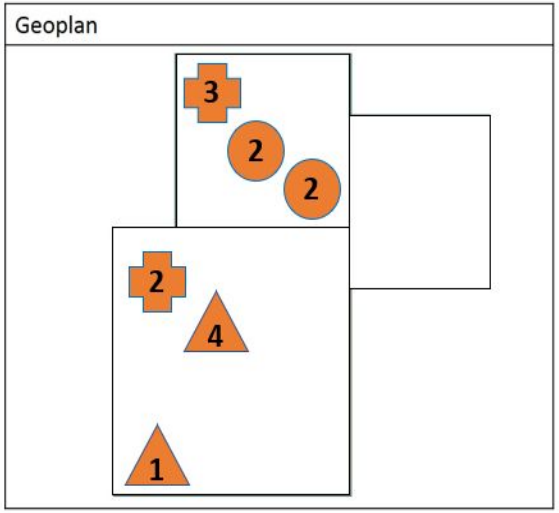
- Whenever you look at a map, you inherently start turning that map into information by finding patterns, assessing trends, or making decisions
- This process is called spatial analysis, and it's what our eyes and minds do naturally whenever we look at a map



- The way you display the data on the map can change the patterns you see
- Spatial analysis tools allow you to quantify patterns and relationships in the data
- Spatial analysis tools empower you to answer questions and make important decisions using more than a visual analysis

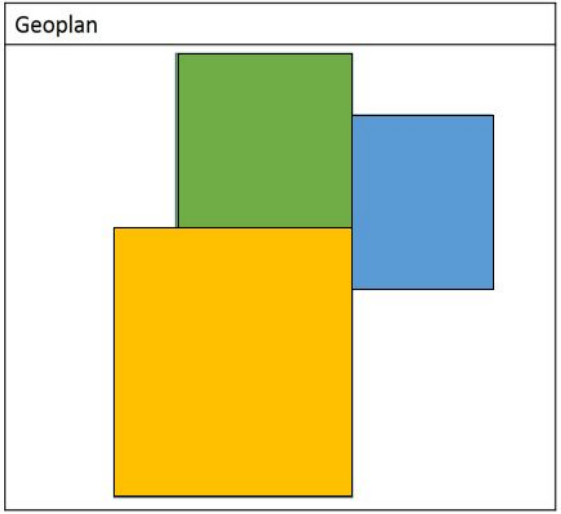
3. Analyze spatial data on ArcGIS

- Layering different types of data is great for identifying visual patterns
- If you are interested in exploring statistical patterns between data layers, the most common analysis tool is a spatial join



Spatial joins combine the information from two features based on their spatial location

Let's say we have this map of reported incidents (orange shapes), and city boundaries (yellow, green, blue squares). If we want to know which city has the least incidents reported, we can see visually that the blue city had no incidents. But what if we had 500 cities?

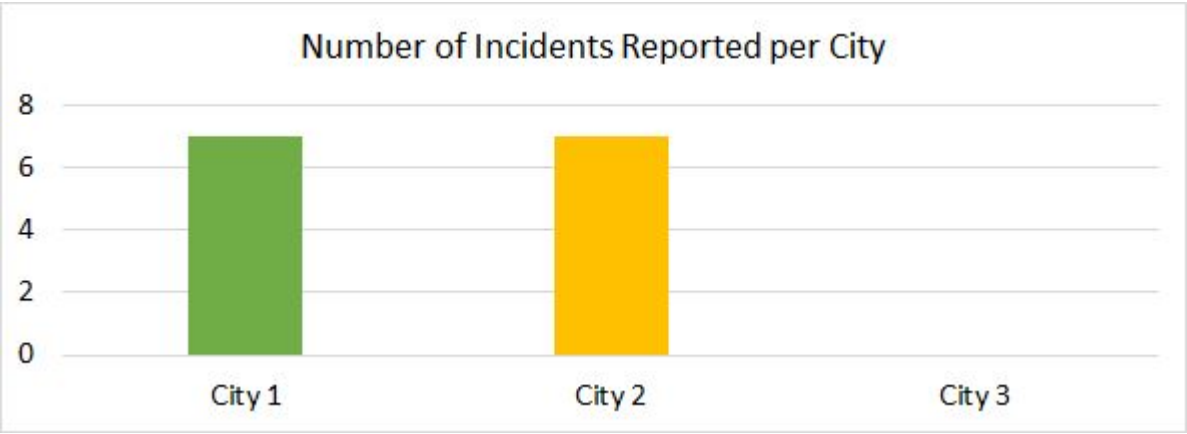


3. Analyze spatial data on ArcGIS

Spatial joins combine the information from two features based on their spatial location

If we want to know how many incidents were reported per city, we can do a spatial join to summarize the number of incidents reported within each city's limits.

Basically, we are adding all of the information from the incident layer to the city layer. This enables us to perform further quantitative analyses.



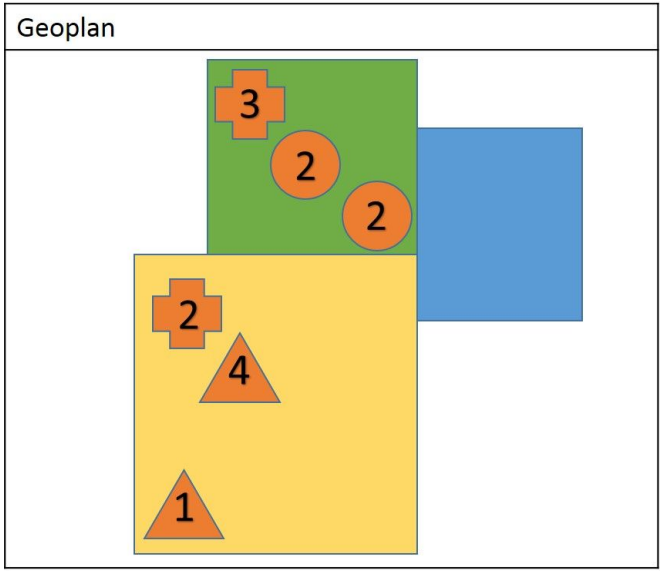
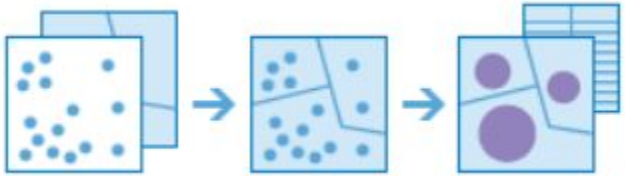


Table 2: No. of Incidents per City

City Names	Blockage Total	Flooding Total	Odour Total
City 1	3	4	
City 2	2		5
City 3			

3. Analyze spatial data on ArcGIS

Other common analysis tools:



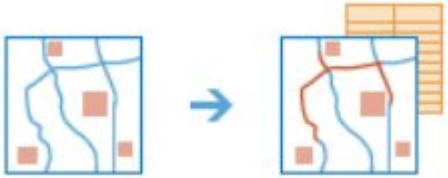
Aggregate points within a boundary
(ex - summarize number of COVID cases per county)

Interpolate data based on existing point values
(ex - you have points of precipitation and want to predict the values in ungauged areas)

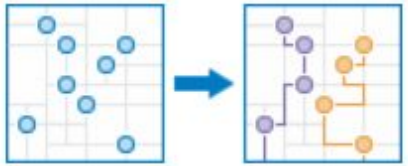
Create buffers around existing points
(ex - around a river to identify the floodplain)

3. Analyze spatial data on ArcGIS

Other common analysis tools:



Find nearest point of interest
(ex - find nearest public library to a school)



Plan routes to points of interest
(ex - find shortest path to get from public library to school)

Find point clusters
(ex - find herds of sheep in a landscape based on GPS sheep location data)

Summary

1. There are MANY existing environmental and social justice datasets available through ArcGIS that you can access
2. Choosing how you visualize your data enables you to present different types of information
3. Analyzing spatial data can be used to show patterns and ask questions that simple visual analysis cannot answer

Resources

1. There are many educational resources available online through ArcGIS and beyond
2. We have compiled a list of resources, tutorials, and examples in the Participant Agenda
3. Please share any maps or StoryMaps that you make with your class: spedemonte@berkeley.edu

THANK YOU!

Feel free to send me any questions at hanamoidu@berkeley.edu