Linking Tabular Data to Geospatial Data

This tutorial is part of an educational series produced by members of the Big Ten Academic Alliance Geospatial Information Network.

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Introduction

This tutorial gives an example to help students understand GIS technology allows people to connect data with geography. GIS can relate unrelated information by using location as the key index variable. Sometimes people don't fully understand their data until they see how it relates to other things in a geographic context. And GIS can help people understand what belongs where.

Through this tutorial, student can get familiar with how to link tabular data to geospatial data by using ArcGIS Online. Instructors can add more exercises based on students' need.

Download Data

Geospatial Data is the data about a object that has a geographic component.

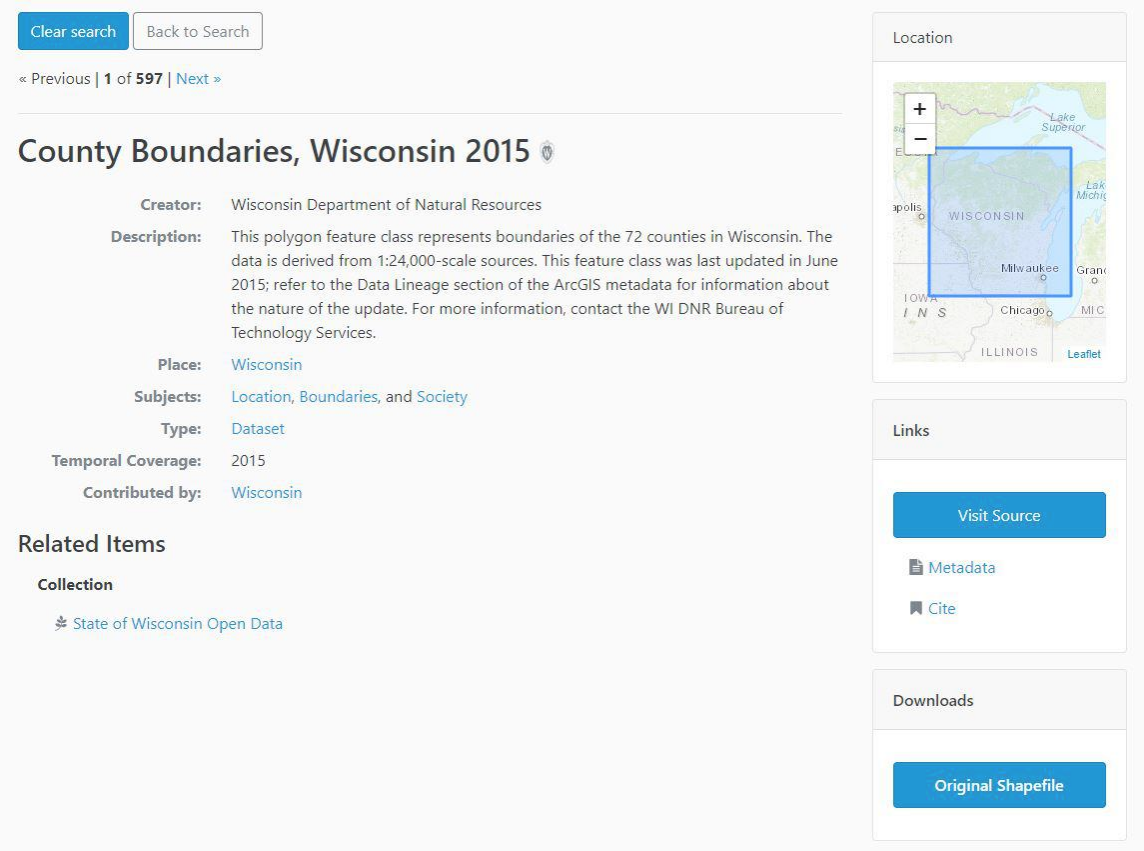
The Big Ten Academic Alliance Geoportal connects users to digital geospatial resources, including GIS datasets, web services, and digitized historical maps from multiple data clearinghouses and library catalogs. The site is solely a search tool and does not host any data.

Visit the Project Documentation page to find out more about our project's history, committees, working groups, conference presentations, and journal articles.

The following steps show how to find geospatial data from BTAA geoportal and tabular data from U.S. Census:

1. Search the keywords "county boundary of Wisconsin" through BTAA geoportal
2. Open the first result "County Boundaries, Wisconsin 2015"
3. Click the "Original Shapefile" button to download the data. Save as "WI_Counties_2015.zip"

This polygon feature class represents boundaries of the 72 counties in Wisconsin. The data is derived from 1:24,000-scale sources. This feature class was last updated in June 2015.



Polygon Feature Class for Wisconsin County Boundaries

1. Open U.S. Census website (https://www.census.gov/en.html) and search the keywords "wisconsin counties by population"
2. Open the first result "County Population Totals: 2010-2019" and click Wisconsin to download the table.

Tables

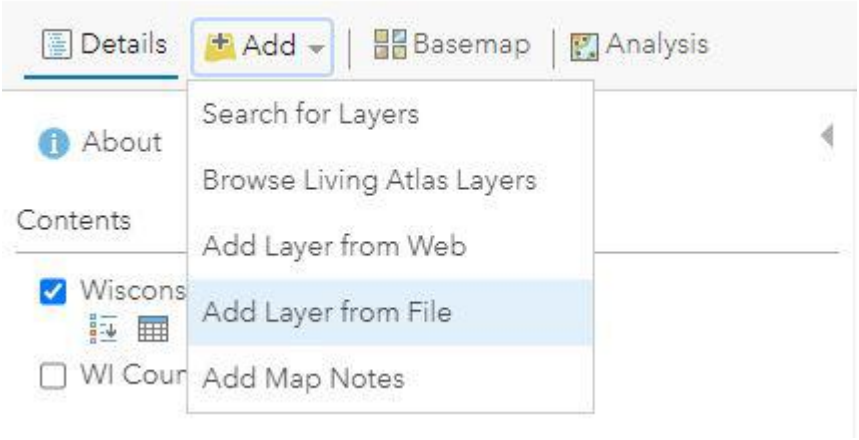
Annual Estimates of the Resident Population for Counties: April 1, 2010 to July 1, 2019

United States
Alabama
Alaska
Arizona
Arkansas
California
Colorado
Connecticut
Delaware
District of Columbia
Florida
Georgia
Hawaii
Idaho
Illinois
Indiana
Iowa
Kansas
Kentucky
Louisiana
Maine
Maryland
Massachusetts
Michigan
Minnesota
Mississippi
Missouri
Montana
Nebraska
Nevada
New Hampshire
New Jersey
New Mexico
New York
North Carolina
North Dakota
Ohio
Oklahoma
Oregon
Pennsylvania
Rhode Island
South Carolina
South Dakota
Tennessee
Texas
Utah
Vermont
Virginia
Washington
West Virginia
Wisconsin
Wyoming

Annual Estimates of the Resident Population for Counties in Wisconsin: April 1, 2010 to July 1, 2019 (CO-EST2019-ANNRES-55), U.S. Census Bureau, Population Division, March 2020

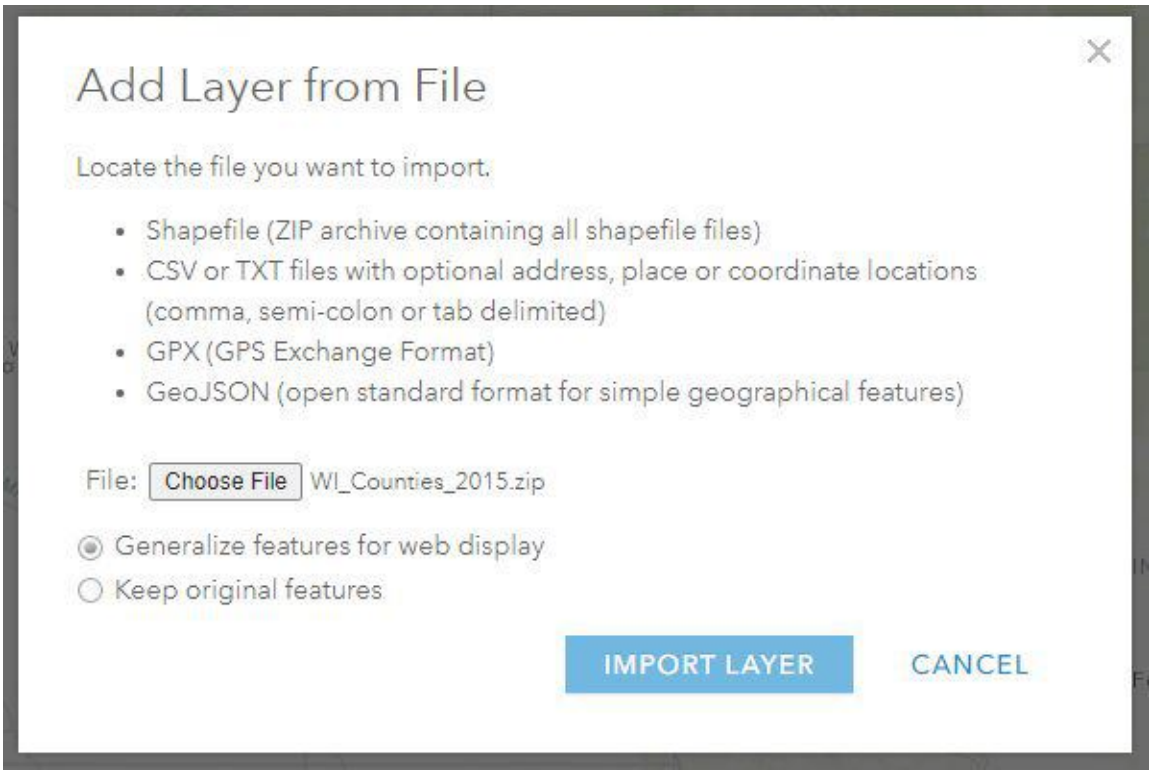
Prepare Data

1. Log into ArcGIS Online and create Web Map



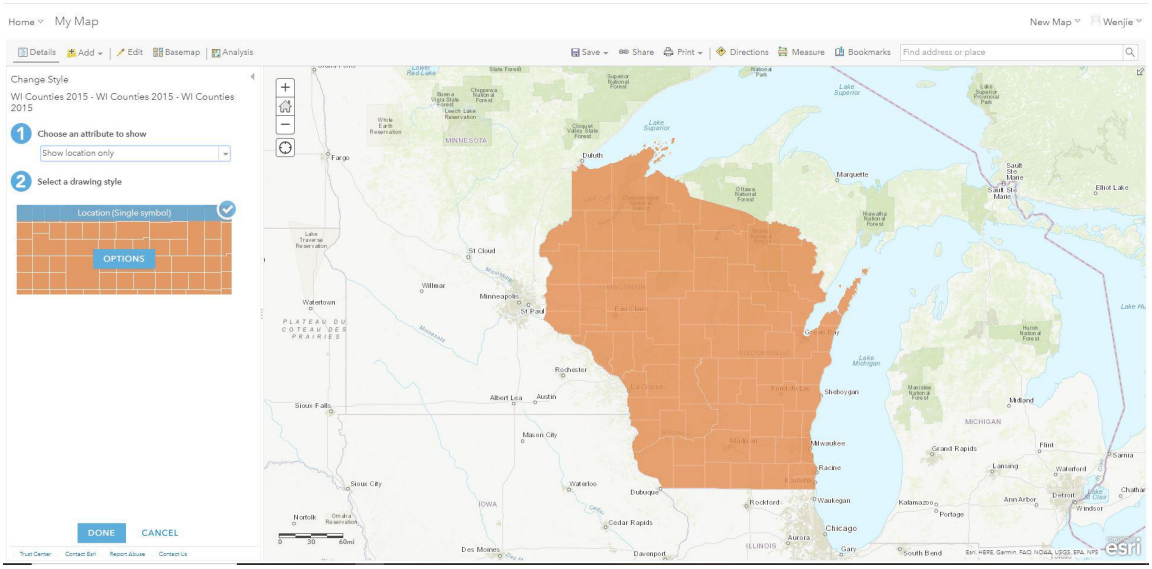
Adding a Layer in ArcGIS Online

1. Add WI_Counties_2015.zip as a new layer from File



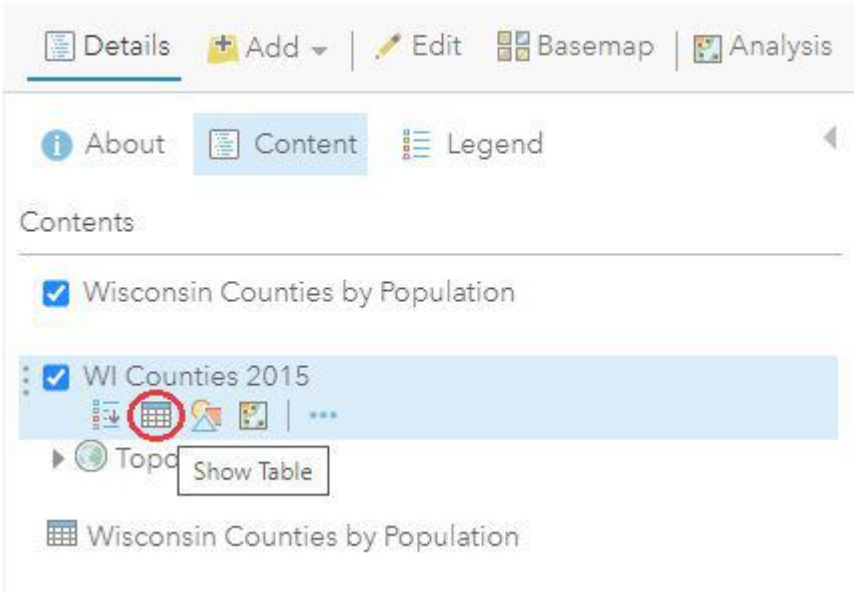
Choosing a File in ArcGIS Online

1. Choose an attribute to show. Here we use “show location only”

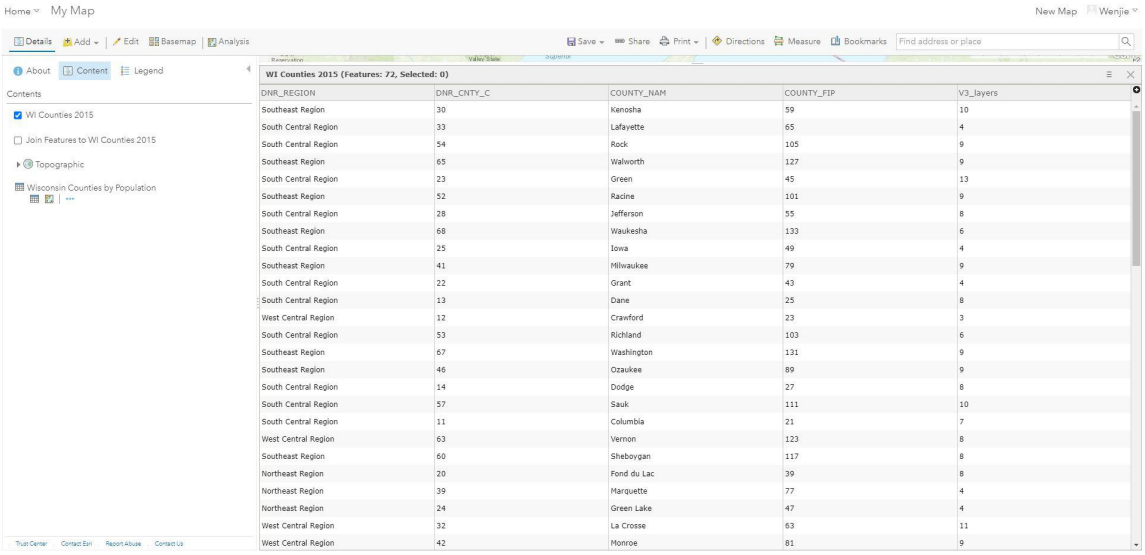


Choosing an Attribute to Show in ArcGIS Online

1. Click “show table” button to open attribute table and get to know what information was included in the geospatial dataset.



Show Table in ArcGIS Online



DNR_REGION	DNR_CNTY_C	COUNTY_NAM	COUNTY_FIP	V3_layers
Southeast Region	30	Kenosha	59	10
South Central Region	33	Lafayette	65	4
South Central Region	54	Rock	105	9
Southeast Region	65	Walworth	127	9
South Central Region	23	Green	45	13
Southeast Region	52	Racine	101	9
South Central Region	28	Jefferson	55	8
Southeast Region	68	Waukesha	133	6
South Central Region	25	Iowa	49	4
Southeast Region	41	Milwaukee	79	9
South Central Region	22	Grant	43	4
South Central Region	13	Dane	25	8
West Central Region	12	Crawford	23	3
South Central Region	53	Richland	103	6
Southeast Region	67	Washington	131	9
Southeast Region	46	Ozaukee	89	9
South Central Region	14	Dodge	27	8
South Central Region	57	Sauk	111	10
South Central Region	11	Columbia	21	7
West Central Region	63	Vernon	123	8
Southeast Region	60	Sheboygan	117	8
Northeast Region	20	Fond du Lac	39	8
Northeast Region	39	Marquette	77	4
Northeast Region	24	Green Lake	47	4
West Central Region	32	La Crosse	63	11
West Central Region	42	Monroe	81	9

Attribute Table in ArcGIS Online

1. Create a new excel file and name it as "Wisconsin Counties by Population.csv". Copy and paste the county name column and population in 2019 column from U.S. Census spreadsheet into this new excel file. We need to use county name as the common field to link those two tables. Therefore, the name of counties in both table should be the same.

   Notice: paste the values only and revise the name of counties by using replace tool.

Table from U.S. Census

Annual Estimates of the Resident Population for Counties in Wisconsin: April 1, 2010 to July 1, 2019												
Geographic Area	April 1, 2010		Population Estimate (as of July 1)									
	Census	Estimates Base	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Wisconsin	5,686,986	5,687,285	5,690,475	5,705,288	5,719,960	5,736,754	5,751,525	5,760,940	5,772,628	5,790,186	5,807,406	5,822,434
Adams County, Wisconsin	20,875	20,867	20,878	20,769	20,417	20,413	20,125	20,028	19,982	19,900	20,341	20,220
Ashland County, Wisconsin	16,157	16,157	16,143	16,029	15,838	15,970	15,995	15,804	15,633	15,501	15,587	15,562
Barron County, Wisconsin	45,870	45,873	45,814	45,890	45,777	45,581	45,349	45,367	45,242	45,141	45,150	45,244
Bayfield County, Wisconsin	15,014	15,008	15,000	15,059	15,057	15,113	14,973	14,976	14,923	15,006	15,026	15,036
Brown County, Wisconsin	248,007	248,003	248,476	250,481	252,682	254,211	256,202	257,856	259,514	261,762	263,165	264,542

New spreadsheet

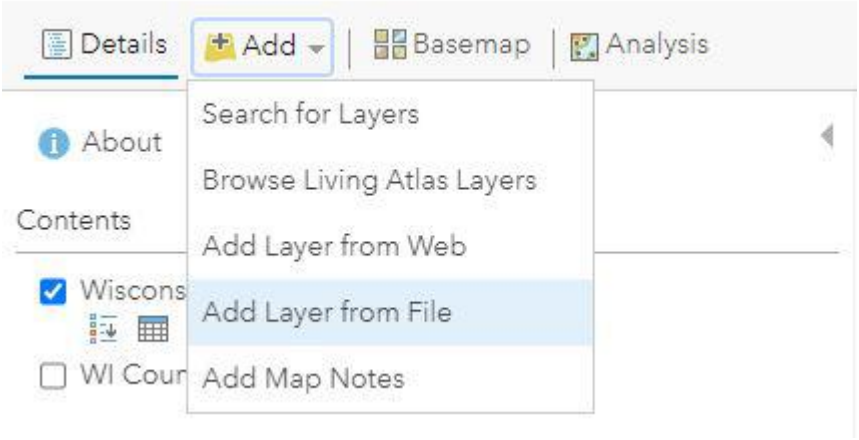
County	Population
Adams	20220
Ashland	15562
Barron	45244
Bayfield	15036
Brown	264542
Buffalo	13031
Burnett	15414

Attribute table of geospatial data

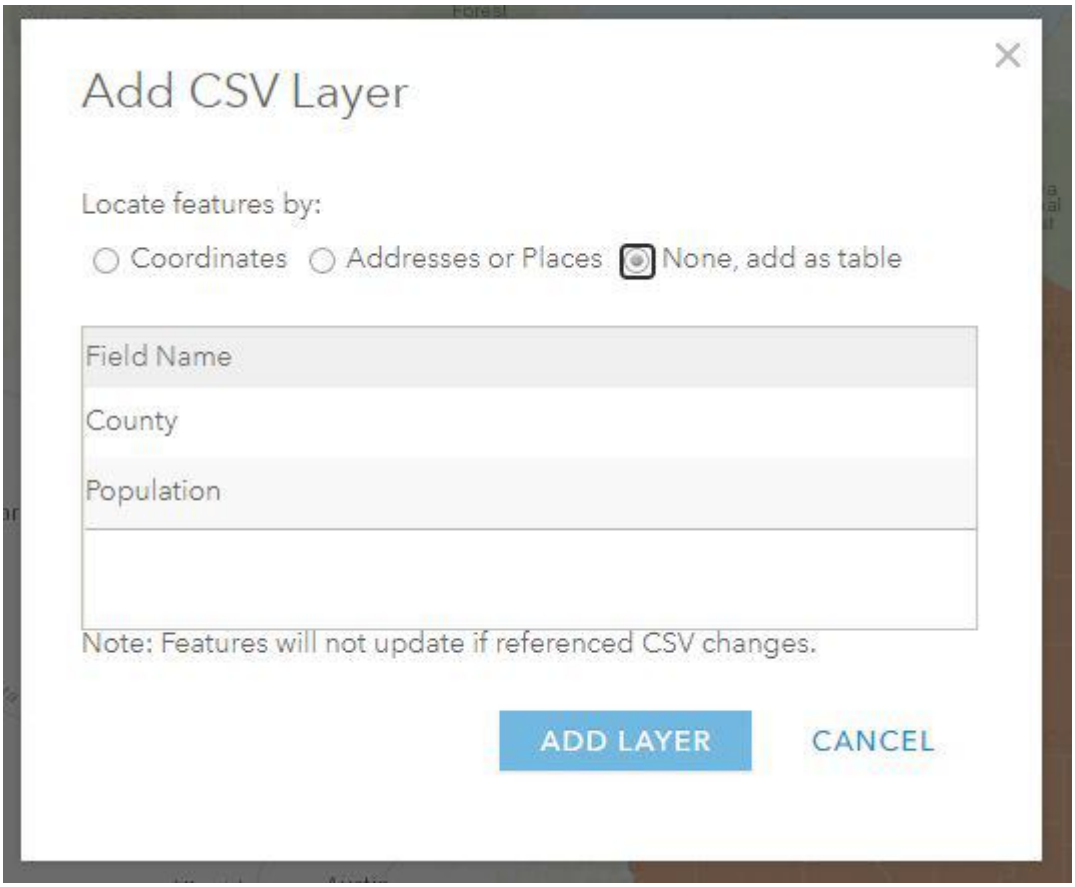
COUNTY_NAM
Adams
Ashland
Barron
Bayfield
Brown
Buffalo
Burnett

Shared Attribute Between Two Tables

1. Add the “Wisconsin Counties by Population.csv” as a new layer and choose “None, add as table”



Add Layer from File

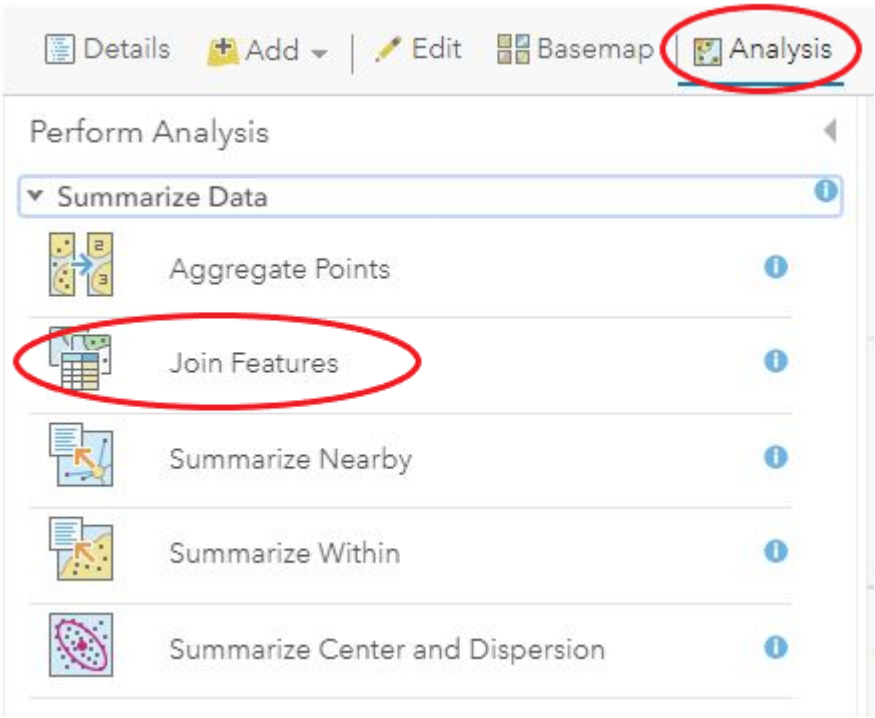


Add CSV

Data Process

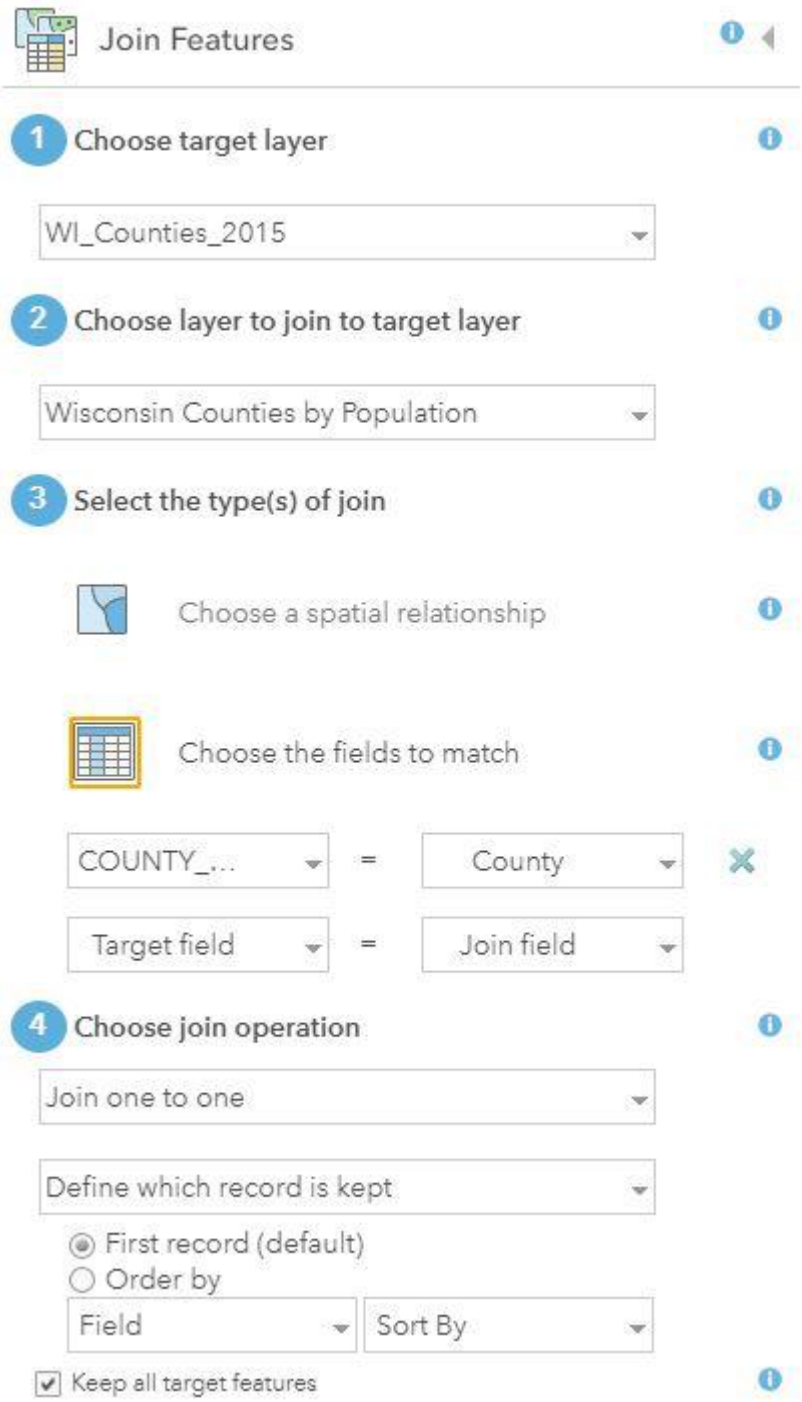
The following steps show how to link tabular data to the geospatial data:

1. Click Analysis and choose Join Features



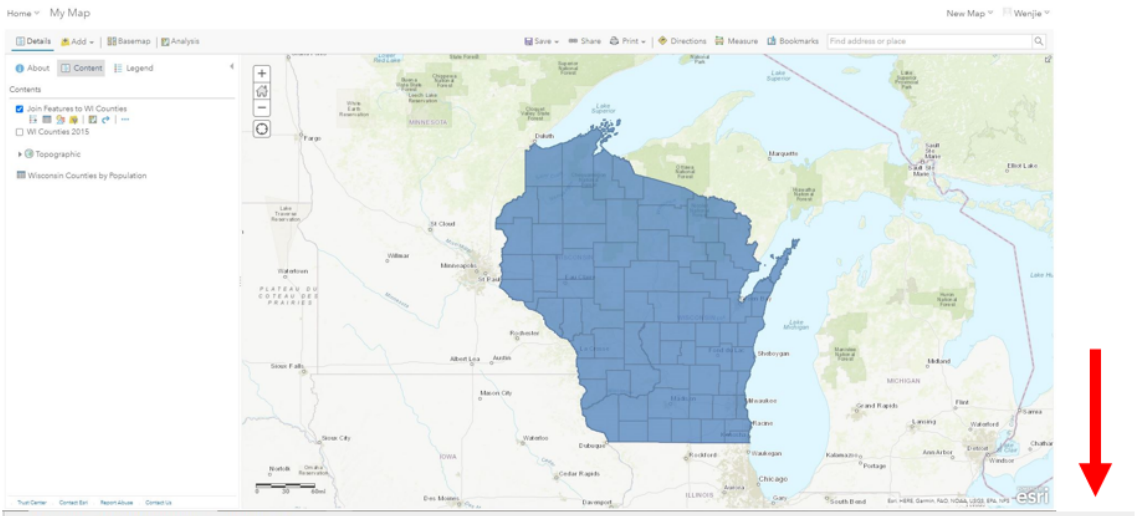
Joining Features

1. Choose WI_Counties_2015 as the “Target Layer” and Wisconsin Counties by Population as the “Layer to Join to the Target Layer”.
2. Choose the “COUNTY_Nam” and “County” as the fields to match.
3. Choose a one-to-one join operation and name the result layer as Wisconsin Counties by Population.



Join Features Input Form

1. Click the Run Analysis button, and a new layer based on population will be shown.

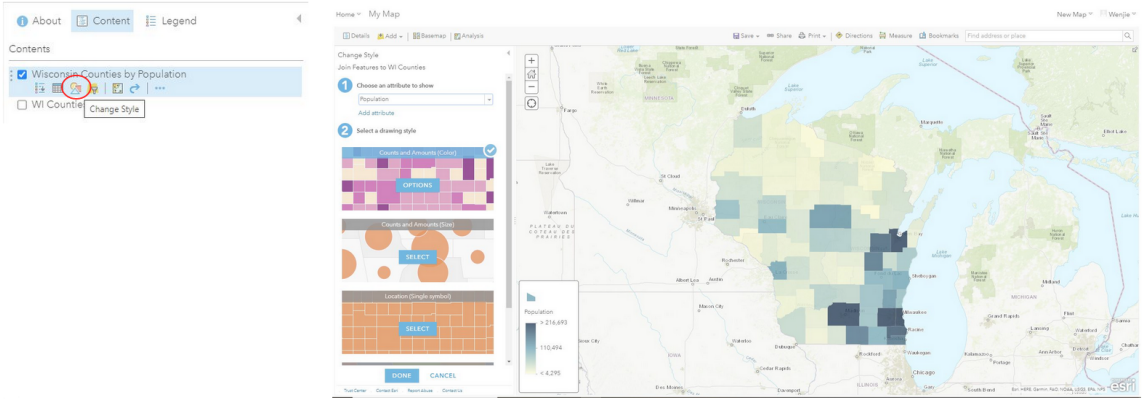


Population Test new (Features: 72, Selected: 0)

DNR_REGION	DNR_CNTY_C	COUNTY_NAM	COUNTY_FIP	V3_layers	Population
West Central Region	1	Adams	1	6	20,220
Northern Region	2	Ashland	3	10	15,562
Northern Region	3	Barron	5	4	45,244
Northern Region	4	Bayfield	7	10	15,036
Northeast Region	5	Brown	9	7	264,542

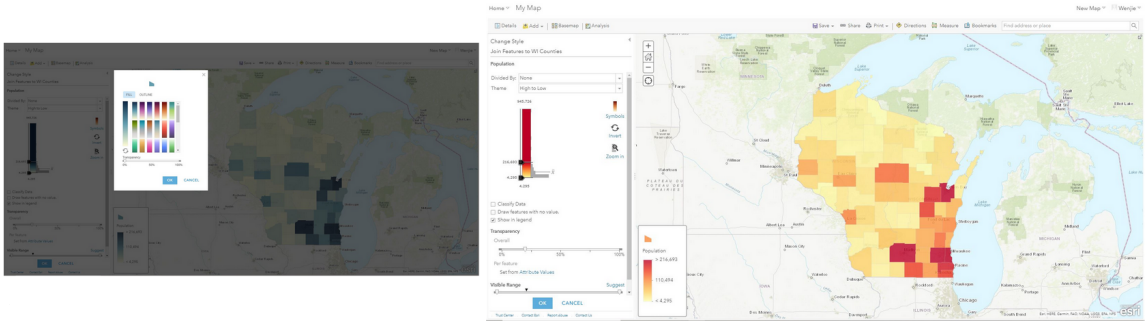
Join Output

1. Symbolize the Wisconsin Counties by Population layer by clicking “change style” button



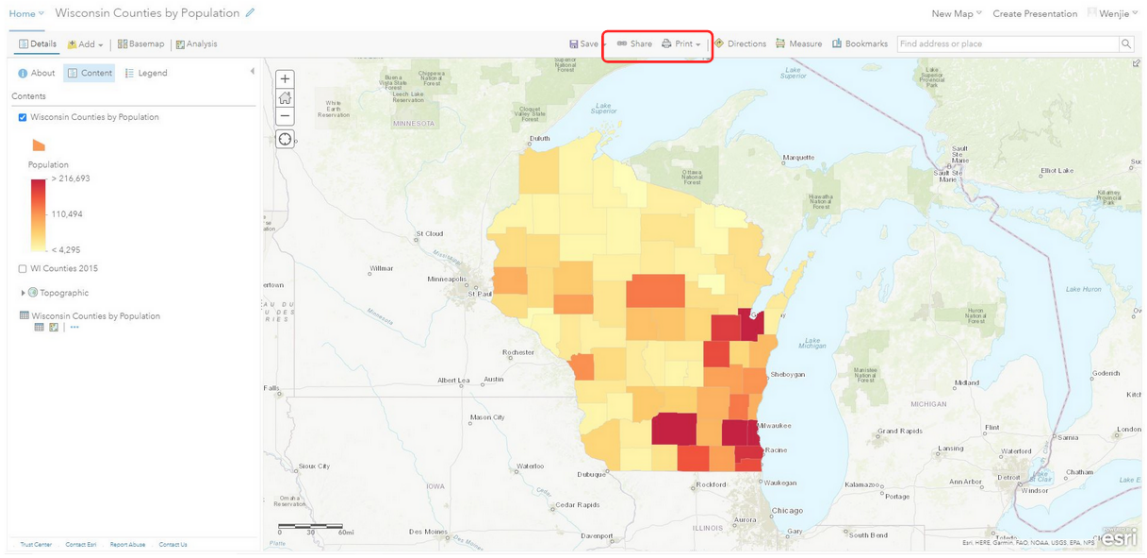
Change Layer Style

1. Choose the appropriate style to clearly show the population



Reset Choropleth Symbology

1. Share or Print the Wisconsin Counties by Population map
2. For copyright information, refer to the copyright tutorial



Share or Print

Exercise

Questions

1. What's the advantage of mapping tabular data?
2. Choose different basemap and use different symbol to create different thematic map.
3. Download a shapefile data related to students' research field and link their tabular data to it.

Wrapping Up

This tutorial is part of an educational series produced by members of the Big Ten Academic Alliance Geoportal. The BTAA Geoportal connects users to digital geospatial resources, including GIS datasets, web services, and digitized historical maps from multiple data clearinghouses and library catalogs. The site is solely a search tool and does not host any data.\ To access additional tutorials in this series that cover various other topics, visit: https://sites.google.com/umn.edu/btaa-gdp/tutorials.