

# MODULE 2

## EXPLORING ArcGIS Online

<b>SUMMARY:</b>	Students will learn how to access ArcGIS Online and navigate through the program by exploring a map and spatial data.
<b>ACTIVITIES:</b>	Learn how to access and open a map in ArcGIS Online. Explore features, tools, and spatial data in ArcGIS Online. Assess the spatial patterns of counties and land ownership.
<b>EDUCATION STANDARDS:</b>	Utah Science Core 9-12 - Earth Science: Standard 5, Objective 2d Utah Social Studies Core 9-12: Utah Studies Strand 5, Standard 5.2 Utah Social Studies Core 9-12: World Geography Strand 1
<b>MODULE LINKS:</b>	<a href="https://arcg.is/CWKKO">https://arcg.is/CWKKO</a>

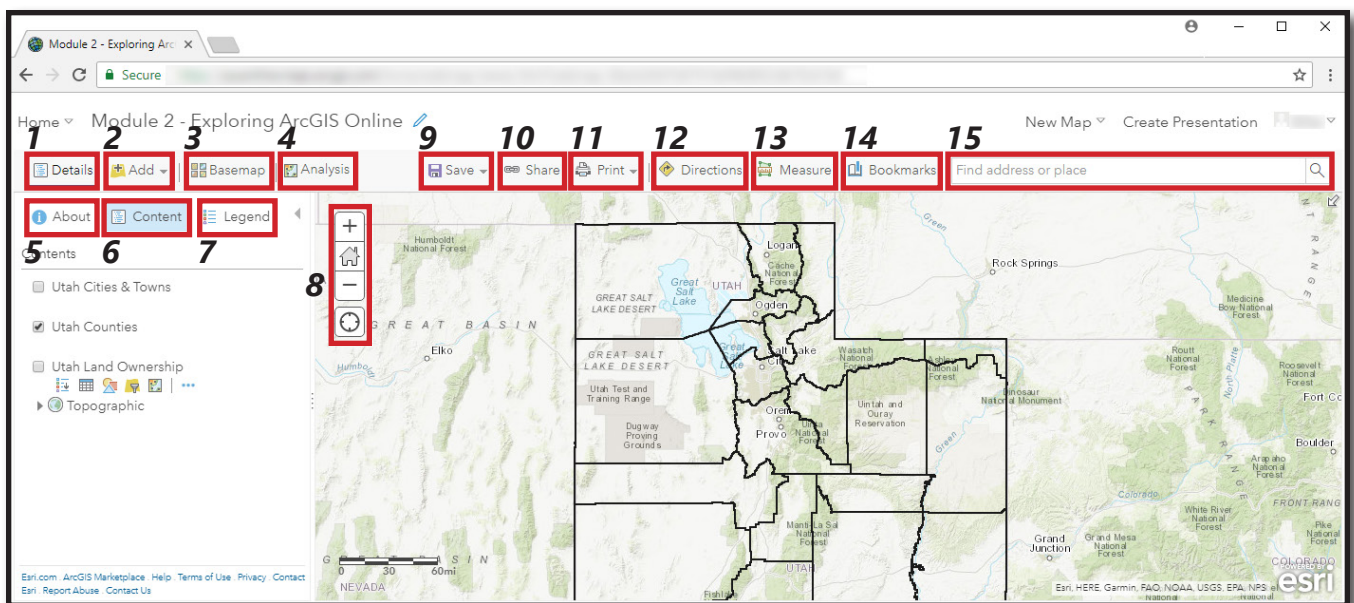
## GLOSSARY

<b>Attribute:</b>	Information about a geographic object that is generally stored in a table associated with a spatial data set.
<b>ArcGIS Online:</b>	An online, collaborative web-based GIS that allows individuals to use, create, and share maps and spatial data.
<b>Basemap:</b>	The collection of spatial data and imagery that form the background setting for a map.
<b>Content:</b>	The spatial data layers within an ArcGIS Online map.
<b>Geographic Information Systems (GIS):</b>	An integrated computerized framework used to manage information about geographic features, analyze spatial relationships, and model spatial processes.
<b>Land Ownership:</b>	The owner or proprietor of land, generally categorized as federal, private, state, or tribal.
<b>Legend:</b>	A key that describes the types of features included in a map.
<b>Pop-up Window:</b>	A window that appears and displays attribute information when a geographic feature in ArcGIS Online is selected.
<b>Spatial Analysis:</b>	The systematic examination of a geographic question or problem.
<b>Spatial Data:</b>	Layers of information that represent objects, events, or phenomenon that occur on, or near the surface of the Earth.
<b>Symbology:</b>	The set of rules or encoding systems that define how geographic features are displayed on a map.

## INTRODUCTION

**ArcGIS Online** (<https://www.arcgis.com/home/index.html>) is a collaborative, web-based mapping application that allows individuals to use, create, and share maps and **spatial data**. In this module, you will be introduced to the basic features and tools in ArcGIS Online and you will begin to explore some spatial data. First, open the map titled *Module 2 - Exploring ArcGIS Online* (<https://arcg.is/CWKKO>). An ArcGIS Online map will open and you will see a spatial data layer that depicts the counties in Utah. This data layer is called *Utah Counties*.

Before you begin exploring the map and spatial data layers, there are several buttons in ArcGIS Online that need to be defined. These buttons will help you navigate through the program more efficiently. Depending on the level of your ArcGIS Online account, these options will differ. More advanced accounts include more **spatial analysis** options.

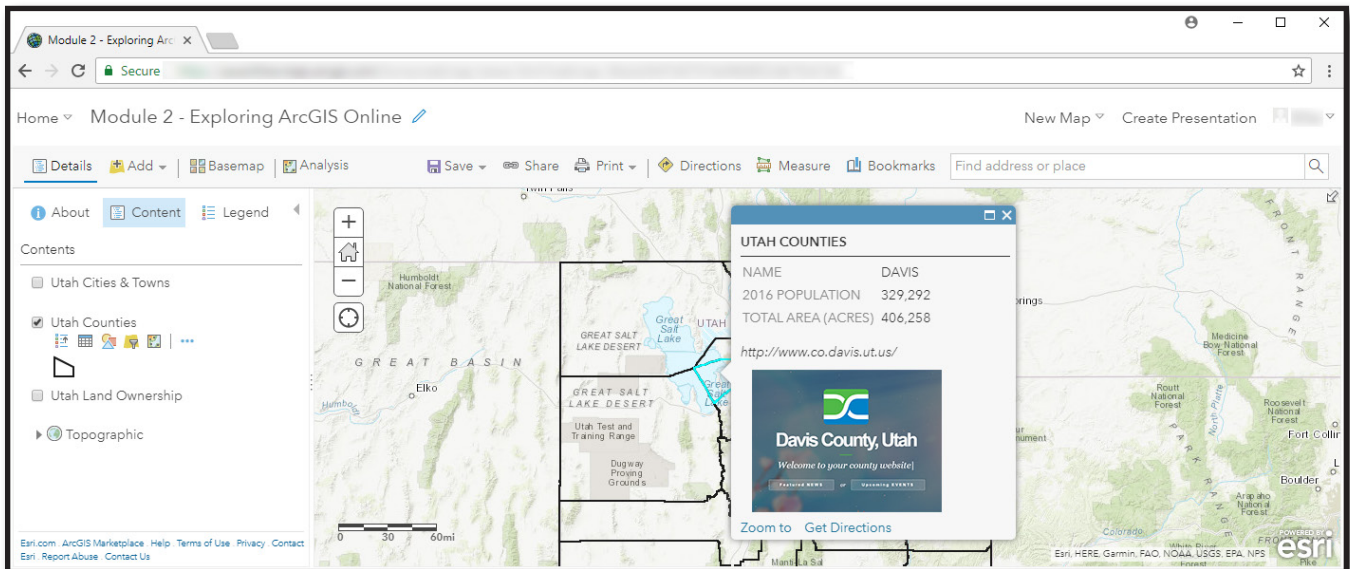


1. **Details:** Clicking the *Details* button will hide or show the *About*, *Content*, and *Legend* window that is directly located below the *Details* button.
2. **Add:** Clicking the *Add* button allows individuals to add spatial data layers to the map view.
3. **Basemap:** A basemap is the collection of imagery and data that form the background setting of the map. In the graphic above, the basemap being displayed is a topographic map. ArcGIS Online has several basemaps to choose from.
4. **Analysis:** Clicking the *Analysis* button will display a list of geoprocessing tools that can be used to conduct different types of spatial analysis.
5. **About:** The *About* button provides individuals with basic map details, including who created the map, when the map was modified, and the intended use of the map.
6. **Content:** The *Content* button allows individuals to view, turn on, turn off, manage, and manipulate spatial data layers.
7. **Legend:** The *Legend* button allows individuals to switch to a legend view.
8. **Navigation:** The *Navigation* panel allows individuals to zoom in, zoom out, return home, and find my location.
9. **Save:** The *Save* button allows individuals to save the map to an ArcGIS Online account.
10. **Share:** The *Share* button allows individuals to share the map and map content with other ArcGIS users or the general public. Map and data sharing are dependent on map security settings.
11. **Print:** The *Print* button allows individuals to print a map with or without a legend.
12. **Directions:** Clicking the *Directions* button will activate the ArcGIS Online *Directions* widget. The *Directions* widget provides a quick and efficient method of calculating turn-based directions between two or more locations.
13. **Measure:** The *Measure* button allows individuals to measure areas and distances and to find distances in different units of measurement.
14. **Bookmarks:** The *Bookmark* button allows individuals to create a spatial bookmark over a specific area of interest.
15. **Find Address:** The *Find Address or Place* feature allows individuals to search for an address, location name, or feature name. ArcGIS Online will return a selectable list of matching names. By selecting on one of the results, ArcGIS Online will zoom to that location.

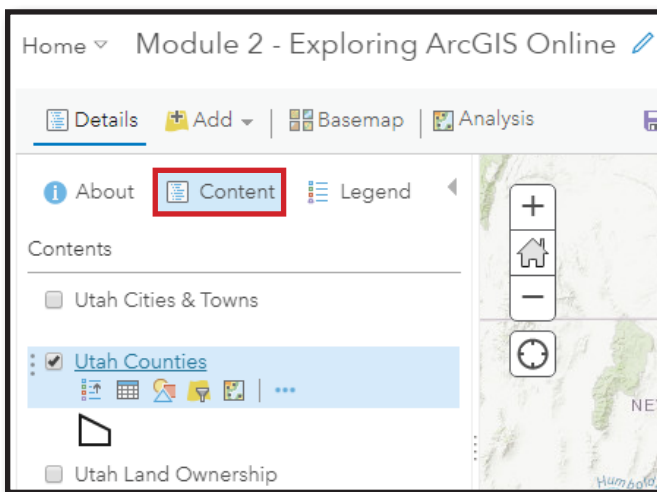
# INTERACTION

Now that you have identified some of the basic features and tools in ArcGIS Online, you can begin to interact with the program and learn how to navigate through spatial data. **Spatial data** are layers of information that represent objects, events, or phenomenon that occur on or near the surface of the Earth. Spatial data have geographic locations and they commonly contain **attributes**, or non-spatial information that describes the characteristics of geographic features. There are a few different ways to examine attribute information in ArcGIS Online.

In the map titled *Module 2 - Exploring ArcGIS Online* (<https://arcg.is/CWKKO>), use your mouse cursor to identify a county of interest. Left click on the county. When clicked, there are two visible results. First, the county that you selected will be highlighted with a blue line. This portion of the spatial data layer is now active. Second, an informational **pop-up window** will appear. **Pop-up windows** display attribute information. In the case of the *Utah Counties* data layer, the pop-up window has been configured to display the county name, the 2016 population, the size of the county in acres, a link to the county website, and a thumbnail image of the county website. To learn more about counties in Utah, click on the thumbnail image and you will be directed to the county website in a new browser window.



Another method for viewing attributes is to open the attribute table. In some instances, it is more useful to view all of the attribute information rather than clicking on each geographic feature. To access the attribute table for the *Utah Counties* data layer, click the *Content* button (#6). By clicking on the *Content* button, you will see the **content**, or spatial data layers, associated with the ArcGIS Online map. In this map, there are three spatial data layers: *Utah Cities & Towns*, *Utah Counties*, and *Utah Land Ownership*. Below the name of each data layer, there are generally six visible buttons that enable users to conduct different assessments of the spatial data. If the buttons are not visible, hover over the the spatial data layers with your mouse to view them.



**A B C D E F**

- A. Show Legend:** The *Show Legend* button displays the data layer legend below the name of the layer.
- B. Show Table:** The *Show Table* button displays the attribute table.
- C. Change Style:** The *Change Style* button allows individuals to alter the display style, or **symbolology**, of how the data layer appears in the map.
- D. Filter:** The *Filter* button allows individuals to filter the layer by non-spatial attribute information.
- E. Perform Analysis:** The *Perform Analysis* button opens a series of available ArcGIS Online tools which will permit individuals to conduct **spatial analysis**. This button is similar to the *Analysis* button (#4).
- F. More Options:** The *More Options* button reveals an extensive menu of additional ArcGIS Online options.

With this basic overview of the options associated with the *Content* button, you can now open the attribute table of the *Utah Counties* spatial data layer by selecting the *Show Table* button (B).

NAME	2016 POPULATION	TOTAL AREA (ACRES)
BEAVER	6,437	1,654,688
BOX ELDER	51,528	4,306,710
CACHE	118,824	750,044
CARBON	20,733	949,903
DAGGETT	751	460,099

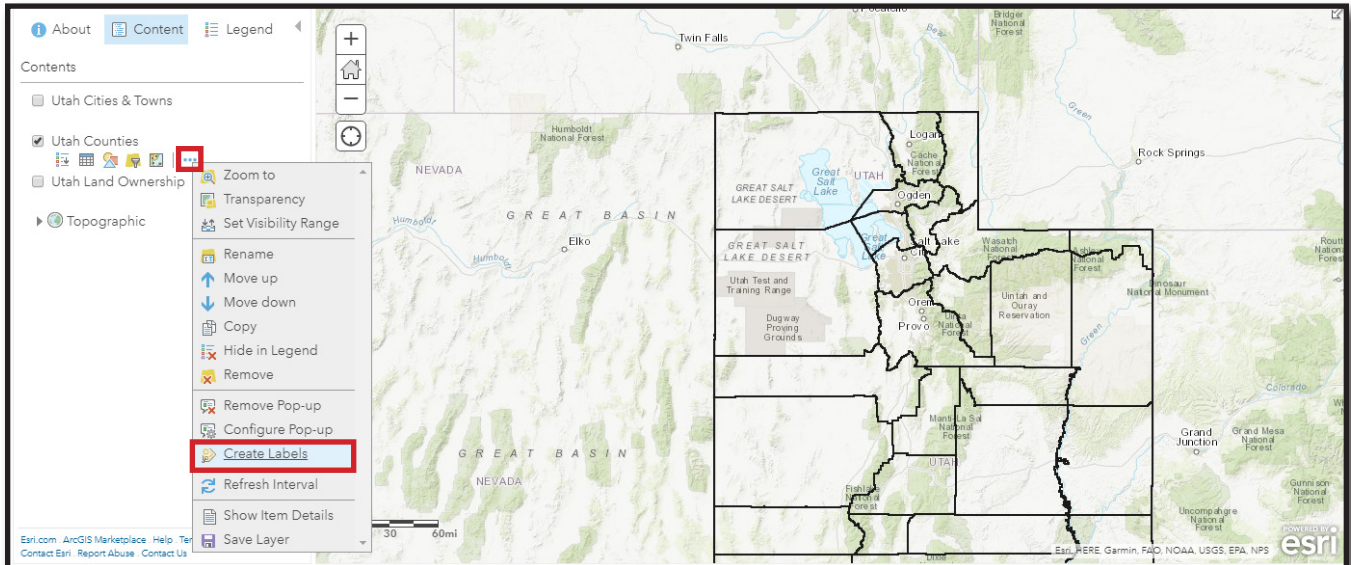
The attribute table is similar to a spreadsheet. The columns can be sorted from highest to lowest or alphabetically. To sort an attribute within an attribute table, left click on a column heading and select *Sort Ascending* or *Sort Descending*. In this example, you can sort the population or area of the county from highest to lowest (descending) or lowest to highest (ascending).

NAME	2016 POPULATION	TOTAL AREA (ACRES)
SALT LAKE	515,320	515,320
UTAH	1,370,167	1,370,167
DAVIS	406,258	406,258
WEBER	422,056	422,056
WASHINGTON	151,959	1,556,251
CACHE	118,824	750,044
TOOELE	61,986	4,663,363
BOX ELDER	51,528	4,306,710
IRON	47,751	2,112,861

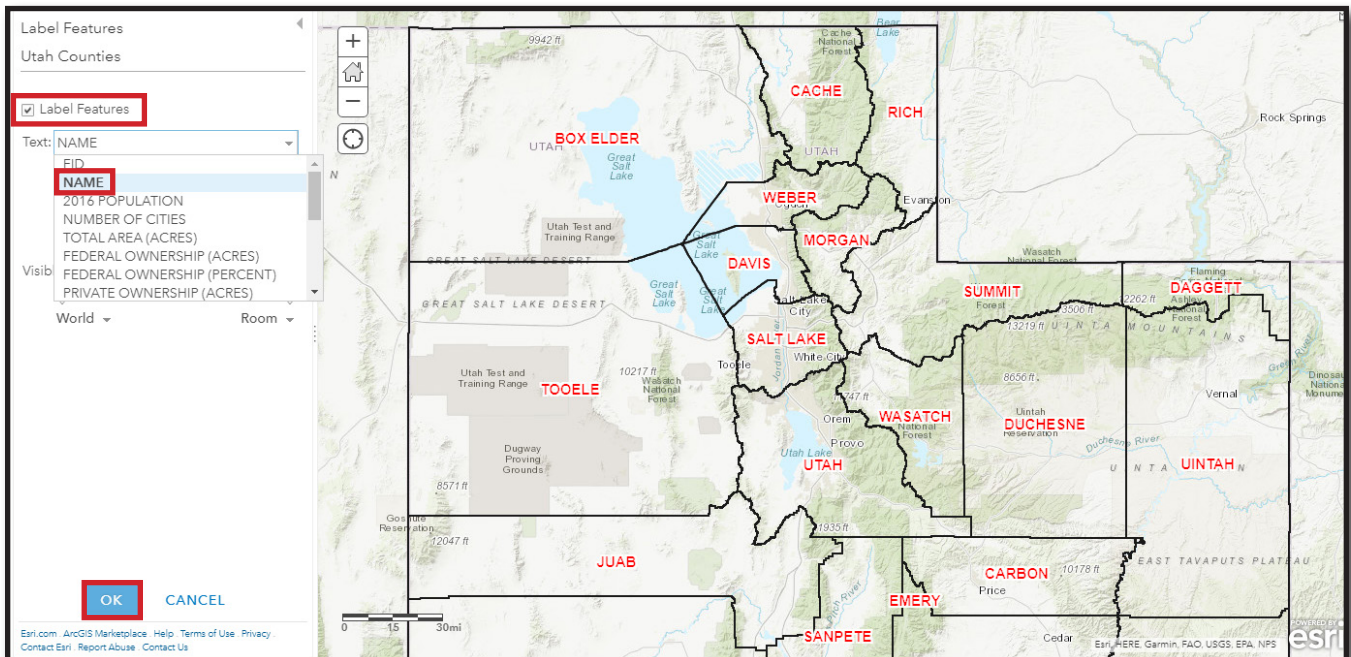
In addition to understanding the attribute information associated with the spatial data that you are working with, it is valuable to know how to symbolize the data layers. When using a mapping application or GIS, such as ArcGIS Online, one of the common outputs is a map, or a visual representation of the spatial data.

The current view of the map titled *Module 2 - Exploring ArcGIS Online* displays the *Utah Counties* layer as black lines. While this view shows the spatial extent and distribution of counties in Utah, the map could become more meaningful if the counties were labeled or symbolized. For example, you can label the counties by county name or symbolize the counties by population or size. By labeling and symbolizing geographic features, the map becomes more valuable and easier to understand.

To label the counties by county name, click on the *More Options* button (F) under the *Utah Counties* layer. Under the *More Option* menu, select *Create Labels*.

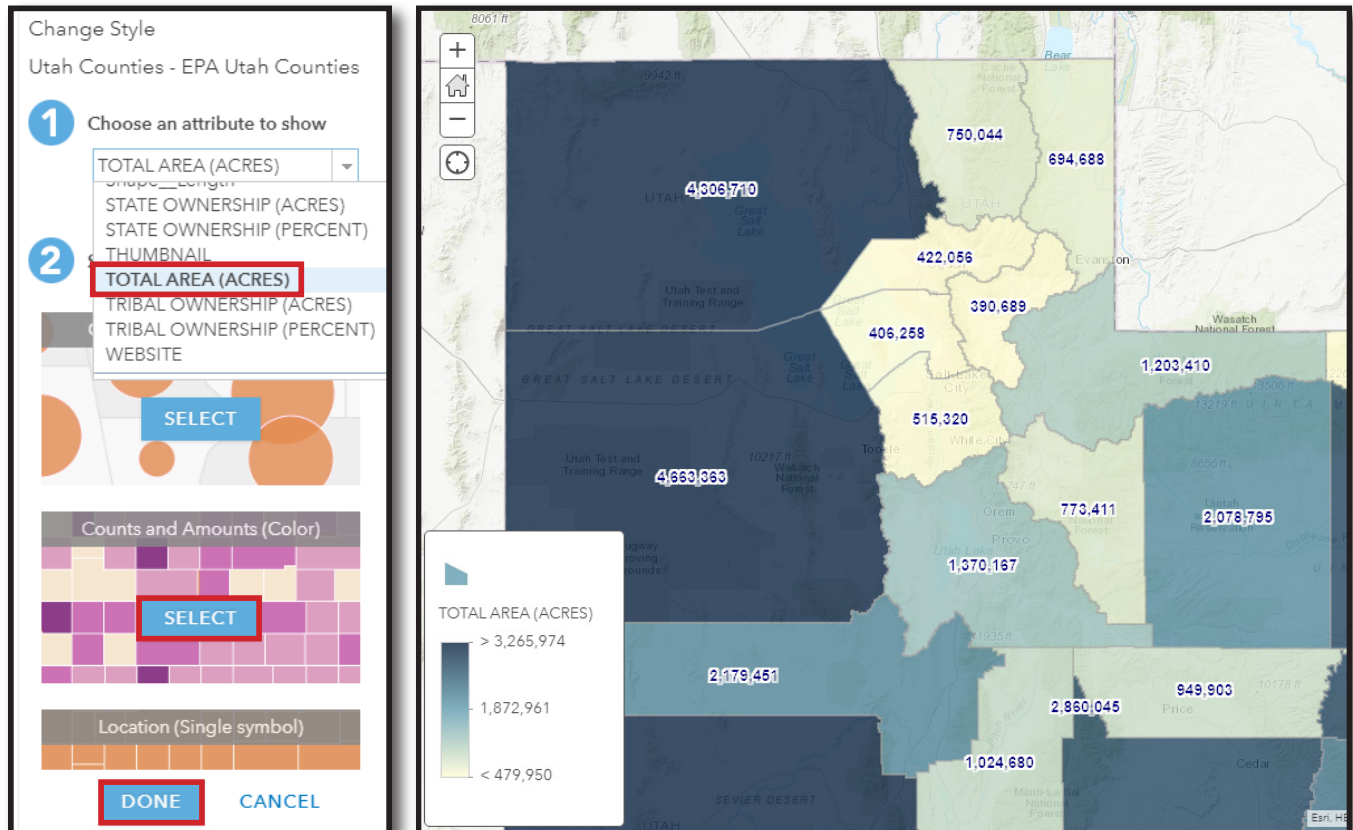


Make sure the *Label Features* checkbox is checked. ArcGIS Online will guess about which label to apply, but the guess may not be correct. To select the correct label, select an attribute from the *Text:* dropdown menu that is located just below the *Label Features* checkbox option. In this example, select the attribute *NAME*. Under this menu, you can also change the size and color of the labels. Select *OK* to apply the changes and to exit the *Label Features* window.



Now that the map includes some useful labels, the map can be symbolized to provide additional information. For example, the *Utah Counties* layer can be symbolized by area in acres. To change the **symbolology**, or the set of rules that define how the geographic features are represented, hover over the *Utah Counties* data layer and select the *Change Style* button (C).

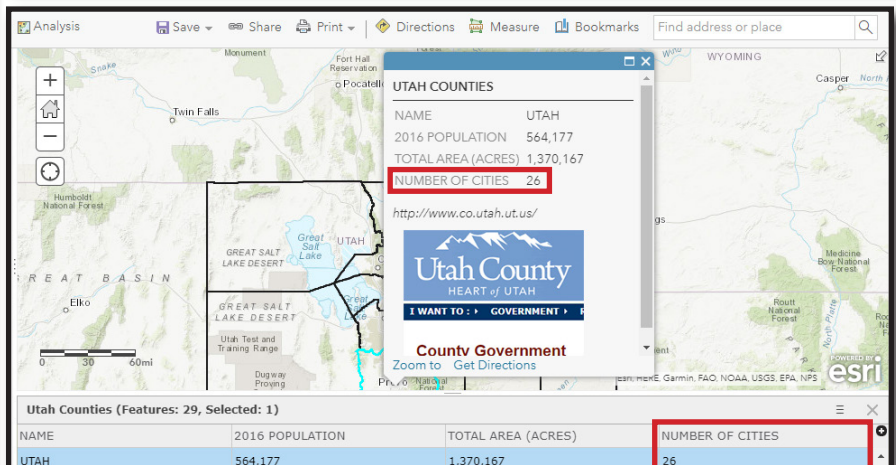
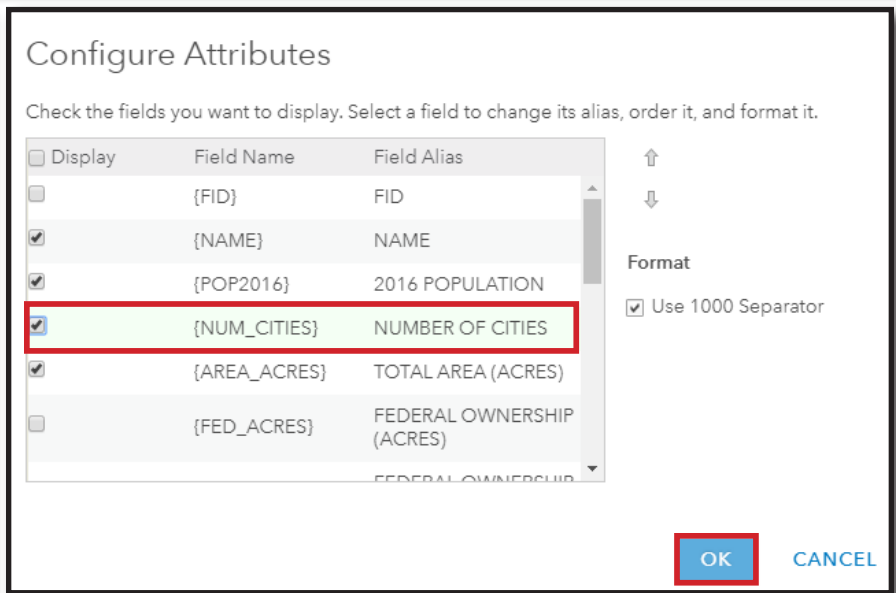
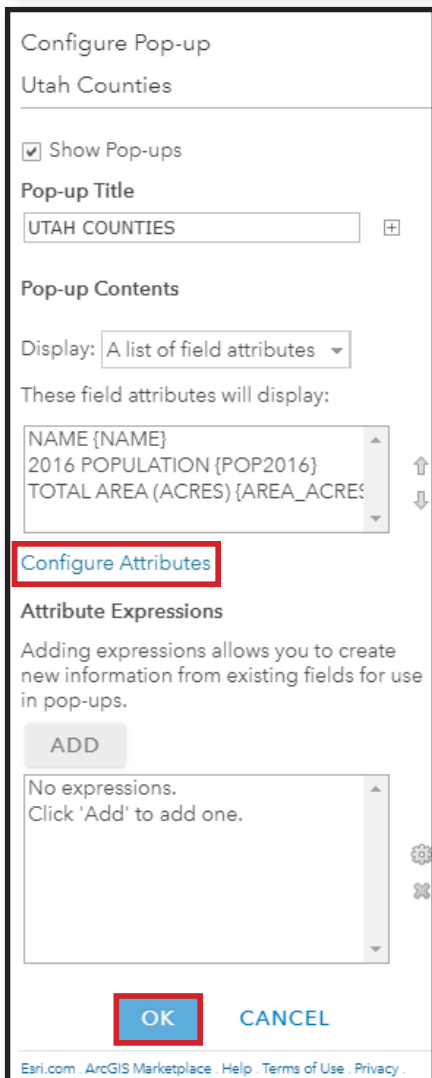
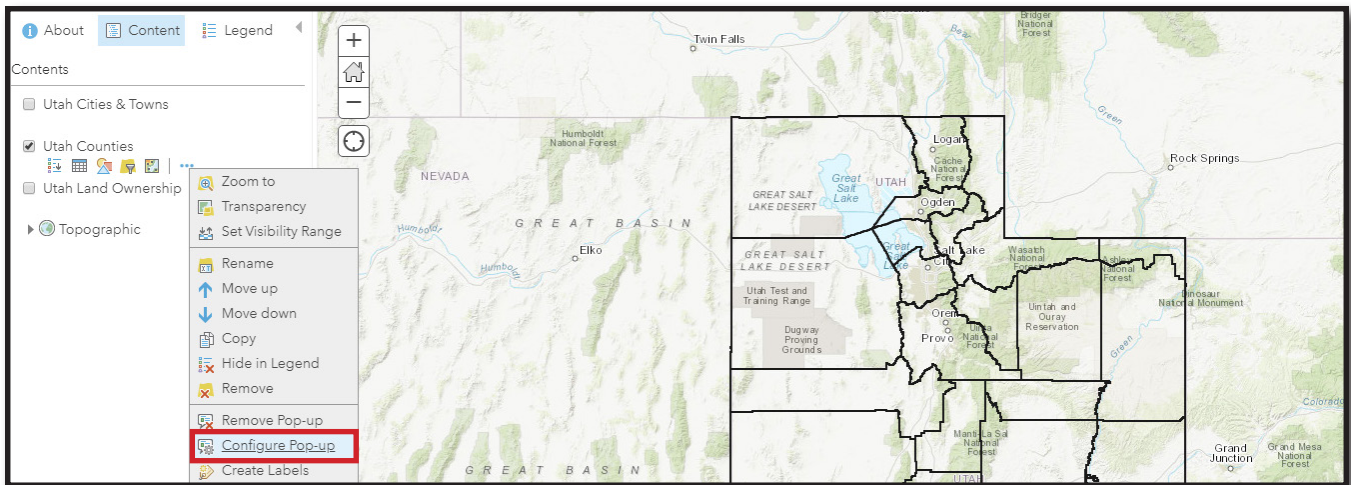
Below (1) *Choose an attribute to show*, click the dropdown menu and select *TOTAL AREA (ACRES)*. These options are sorted alphabetically, so you will need to scroll down to find that attribute. Under (2) *Select a drawing style*, there are four options: *Counts and Amounts (Size)*, *Counts and Amounts (Color)*, *Location (Single symbol)*, and *Types (Unique symbols)*. Click the *SELECT* button under *Counts and Amounts (Color)*. Click the *DONE* button to apply the changes. The *Utah Counties* data layer is now symbolized by a gradient of colors. In this example, the darker blue colors represent counties with the largest area and the light cream color represents counties with the smallest area. After you have changed the symbolology of the data layer, you can also modify the feature labels to correspond to the symbolology.



During this exercise, you may have noticed that there were several attributes to select from under (1) *Choose an attribute to show*. You may have also observed that when you selected the *Show Table* button (B) only three attributes were displayed, including the county name, the 2016 population, and total area in acres. When this map was created, it was configured to only show these few attributes in order to create a simple and clear view of the spatial data layers.

However, there are frequently additional attributes that can be viewed in an ArcGIS Online map. To view additional attributes in the pop-up window and in the attribute table, the map can be customized or configured to display other relevant attribute information. To do this, hover over the *Utah Counties* data layer in the *Content* window. Click on the *More Options* button (F) and then select the *Configure Pop-up* option. In the *Configure Pop-up* window, select *Configure Attributes*. In this window, attributes can be selected (to be shown) or deselected (to be hidden) from display.

For this exercise, place a checkmark next to the *NUMBER OF CITIES* attribute. This attribute represents the number of cities within in each county in Utah. Select *OK* to close the *Configure Attributes* window and then select *OK* to close the *Configure Pop-ups* window. After you have configured the attributes to include the *NUMBER OF CITIES* attribute, you will see this attribute in both the pop-up window and the attribute table.



Before you proceed to the next section, you will want to save your map to your ArcGIS Online account. To save your map, click on the *Save* button (#9) and select *Save As*. You can name your saved map *Module 2 Map*. When working through modules, you can save your maps at any time. Once a map is saved, you can return to them at any time.

# INVESTIGATION

In this module, you have learned about the basic features and tools in ArcGIS Online. You have started to interact with spatial data and attribute information, and you have learned that spatial data is useful for determining location, shape, and size. This module will serve as a reference document for the other modules and it will continue to provide you with the foundational knowledge that you will need to work with other maps and spatial data in ArcGIS Online.

Using the skills that you learned in this module, please answer the following questions:

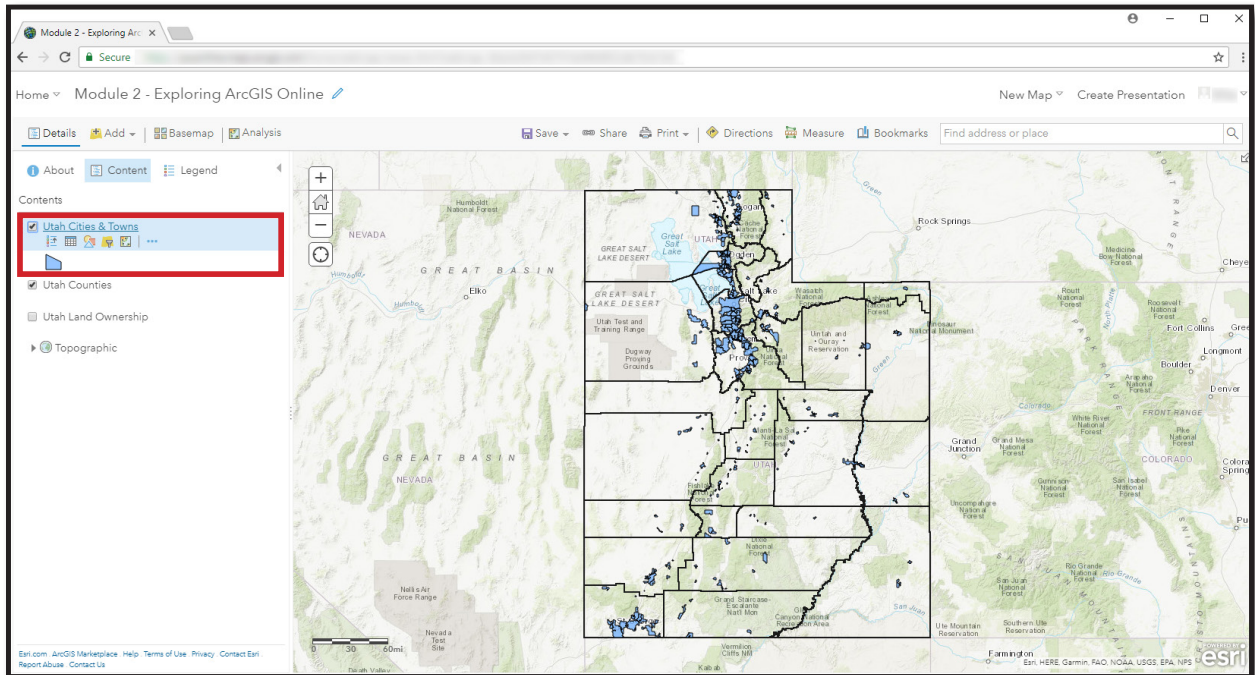
1. The physical size of a region is important for many reasons. For example, elected officials or land managers may need to know the size of a county, city, or particular management area to improve economics and to support decision-making activities. At local scales, farmers need to know the size or area of an agricultural field to determine how much seed to use. Real estate agents need to know the size of parcels to estimate value and determine cost.

By evaluating the *Utah Counties* data layer, identify the two largest and two smallest counties in Utah. You will need to sort the attribute *AREA (ACRES)* to identify these counties.

**What are the two largest counties in Utah by area? Identify names of counties and area in acres.**

**What are the two smallest counties in Utah by area? Identify names of counties and area in acres.**

2. Turn on the *Utah Cities & Towns* data layer by placing a checkmark in the checkbox. This data layer is located above the *Utah Counties* data layer in the *Content* window. This data layer represents the locations and boundaries of cities and towns in Utah, and it is useful for identifying where people are located within the state of Utah.



By visually evaluating the *Utah Cities & Towns* data layer, identify the geographic region in Utah that appears to have the greatest number of cities. You can identify regions of the state, such as Southwestern Utah, or you can identify counties.

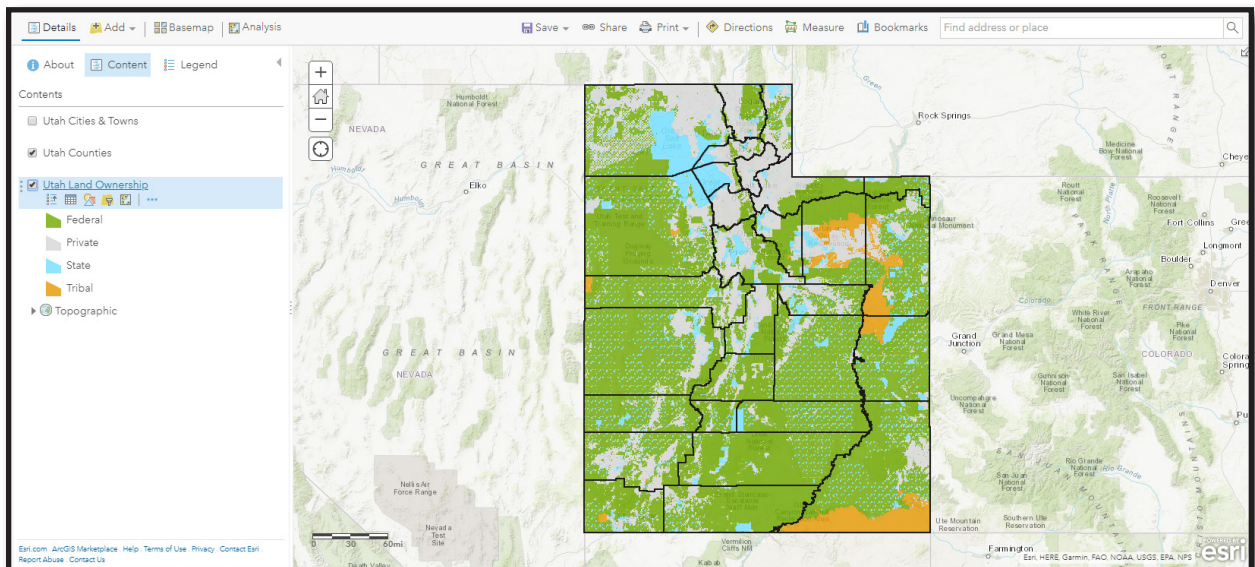
**What regions or counties in Utah appear to encompass the greatest number of cities and towns?**

By evaluating the attribute table associated with the *Utah Counties* data layer, identify the county that contains the greatest number of cities and towns and identify the county that contains the fewest number of cities and towns. You will need to make sure that the attribute *NUMBER OF CITIES* has been selected in the *Configure Attributes* window and added to the attribute table. You will then need to sort the attribute in either ascending or descending order.

**What county in Utah contains the greatest number of cities and towns? Include the name of the county and the number of cities and towns.**

**What county in Utah contains the fewest number of cities and towns? Include the name of county and the number of cities and towns.**

3. Turn on the data layer *Utah Land Ownership* by placing a checkmark in the checkbox. This data layer is located below the *Utah Counties* data layer in the *Content* window. This data layer represents **land ownership** in Utah, or the the owner or proprietor of the land.



The type, amount, and distribution of land ownership is important for land managers and planner when considering the development of urban areas and the protection of ecologically and culturally sensitive lands. Land ownership in Utah can be broadly divided into four categories: federal, private, state, and tribal. Federal lands are lands owned and managed by departments and agencies of the federal government, such as the Forest Service, Bureau of Land Management, or Department of Defense. Many of these lands are accessible for public use and recreation. Private land is land owned by non-governmental legal entities. State lands are lands managed by state agencies. Tribal lands are lands owned and managed by sovereign tribal nations.

**By visually evaluating the Utah Land Ownership data layer, who appears to be the majority land owner in Utah?**

By evaluating the attribute table associated with the *Utah Counties* data layer, identify the county that contains the greatest area (in acres) of federal land and identify the county that contains the greatest percentage of private land. You will need to make sure that the attributes *FEDERAL OWNERSHIP (ACRES)* and *PRIVATE OWNERSHIP (PERCENT)* are added to the attribute table.

**What county in Utah contains the greatest area (in acres) of federal land? Include the name of the county and the number of acres.**

**What county in Utah contains the greatest percentage of private land? Include the name of the county and the percentage.**