Exercise: Examine patterns of population change

GIS maps are sometimes called smart maps because they have data behind the map. This link between map and data offers opportunities to teach concepts that are fundamental to a wide range of subjects, such as classification, spatial relationships, statistics, and geography.

In this exercise, you will search ArcGIS Online for an existing map of population trends. You will explore the map and an associated table to discover patterns of population growth and loss.

**Note:** ArcGIS Online is dynamic, so the interface shown in the content may differ from what you see on the screen.

**Estimated completion time: 40 minutes**

To complete exercises, you need the following:

ArcGIS Online

Course exercises use the free version of ArcGIS Online and can be completed on Windows or Macintosh computers.

Some exercises require you to sign in to an ArcGIS Online account. A public account is sufficient.

Course exercises were developed using the Windows 7 operating system and the Google Chrome browser. If you are using a different operating system or web browser, some user-interface paths and names may differ.

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**Step 1: Search ArcGIS Online for a map**

In the previous exercises, you searched the map for a particular location. You also searched ArcGIS Online for a layer, which you added to your map. You performed these searches in Map Viewer.

Now, you will search for a map that someone else created and saved. You cannot perform this kind of search from Map Viewer. Instead, you will search from the ArcGIS Online home page. (You can also search for maps from the Gallery page.)
If ArcGIS Online is already open, in the upper-left corner, click the ArcGIS down arrow and choose Home.

**Note:** You must be signed in to see the Home option.

If you closed your browser, open a new browser and go to www.arcgis.com/home.

A map named USA Population Trends has been created for this exercise. It contains several demographic layers.

In the upper-right corner of the web page, in the search field, type **population trends**.

Tip: Using double quotation marks allows you to search for the entire phrase instead of the individual words.
In the options that appear, click Search For Maps.

If your search does not return any results, in the left column, turn the Only Search In Esri Training Services option off.

**Note:** You will only see this option if you are signed in to an organization.

Several results are found, sorted by relevance.

Look for USA Population Trends, a web map by EsriTrainingSvc.

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**USA Population Trends**

- Web Map by EsriTrainingSvc

Four selected demographic layers for the United States.

Created: Oct 29, 2013    Updated: Jan 17, 2018    View Count: 9,898

ArcGIS Online is dynamic, so this graphic may differ slightly from what you see on-screen.

Point to the thumbnail and click Open In Map Viewer.

If you receive a warning message, click Yes, Open The Map.

The USA Population Trends map opens in your browser.

**Note:** If you receive an error message that ArcGIS Online is unable to establish a secure connection to a layer, try using a different browser or sign in to ArcGIS Online.

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**Step 2: Examine recent U.S. population change**
The map displays the rate of population change by state in the 10 years from 2000 to 2010.

If the map shows counties, zoom out to view only states.

Step 2a: Examine recent U.S. population change.

Examine the map and legend.
Which parts of the country grew the most?
Did any states lose population during this period?

The map shows you a general pattern of population growth, but a visual analysis alone does not tell you the exact rate of change in each state. To determine the rate of change, view the data in the GIS database associated with the map.

Click one of the dark blue states and look at the pop-up window.
What was the total population of the state in 2010?
Exercise: Examine patterns of population change

Stata Name: Georgia

Population Change 2000 - 2010

Here the population changed by an average 1.8% per year from 2000 to 2010. The 2010 population is 9,687,053.

Zoom to Get Directions

Step 2b: Examine recent U.S. population change.

Point to each bar on the chart.

Did this state grow faster or slower than the U.S. as a whole?

Close the pop-up window.

Click at least two more states of different colors and compare their growth rates with the growth rate of the U.S., closing the pop-up window each time.

- Step 3: Answer questions using the data table

For many map layers in ArcGIS Online, you can show the data in a table. A table can help you answer questions, such as "Which state grew the fastest?"
In the Details pane, click Content.

Click the USA Population Change 2000-2010 layer name.

A list of sublayers appears.

Collapse the Boundaries sublayer.

Point to the Recent Population Change By State sublayer, and click the Show Table button 📊.

**Recent population change by state (Features: 52, Selected: 0)**

<table>
<thead>
<tr>
<th>State Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alabama</td>
</tr>
<tr>
<td>Alaska</td>
</tr>
<tr>
<td>Arizona</td>
</tr>
<tr>
<td>Arkansas</td>
</tr>
<tr>
<td>California</td>
</tr>
</tbody>
</table>

Step 3a: Answer questions using the data table.

The table shows the state name attribute, which is the same attribute that appears in the pop-up window. You can select more attributes to show in the table.

At the right edge of the table, click the plus sign.

Check the box next to All Columns.
Step 3b: Answer questions using the data table.

Scroll the table to the right, and find the column named 2000-2010 Population Change.

Tip: Be certain that you find the column containing the *state* data, not the column named 2000-2010 *US* Population Change.

Click the column heading and choose Sort Descending.

Tip: You can drag the top of the table up to show other rows.

Examine the table, and answer the following questions.

What was the greatest percent population change for any state during this period? Which state was it?

What was the total population of this state in 2010?
Bonus question (optional): Approximately how many people were added to the state in 10 years?

Hint: Use your phone or use the calculator on the computer.

Click the second row (the AZ information) of the table to highlight it.

At the top right of the table, click the Options button and choose Center On Selection.

The map zooms to the state and shows more detailed geography.

Close the table.

Examine the map.

Did population increase evenly across the state?

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Step 4: Look at population change in a city

Next, you will visually analyze the demographics of the Las Vegas, Nevada, metropolitan area.

Adjust the USA Population Change 2000-2010 layer's transparency to approximately 30 percent.

Remind me how

1. In the Contents pane, click the More Options button and choose Transparency.
2. Move the slider between 25 percent and 50 percent.

In the upper-right corner, in the Find Address Or Place field, type Las Vegas and choose Las Vegas, NV, USA from the list of suggestions.
Adjust the map so that you can see the entire metropolitan area, zooming out slightly and centering the map.

Step 4a: Look at population change in a city.

Close the Search Result window.
Explore the map using the techniques that you have learned:

View the map legend.

Click some of the census tracts, and examine the data in each pop-up window.

Point to the chart to see how many people were added to a census tract.

Where did the city grow? Describe the pattern of population increase and decrease in the Las Vegas area.

In the Contents pane, turn on the USA Projected Population Growth 2012–2017 layer.

Display the legend and compare the meaning of the colors in the two layers.

Examine the map and explore some of the pop-up window data.

Tip: A pop-up window can include pages for more than one map feature or layer. Click the arrow at the top of the pop-up window to see the additional information.

Answer the following questions.

Note: Be sure to account for the different classification schemes. Turn the projected population layer off and on as needed.

Is the population boom expected to continue in Las Vegas from 2012 through 2017?

How similar is the geographic pattern of projected change to the 2000-2010 pattern?
When you are finished, turn off the USA Projected Population Growth 2012-2017 layer.

- Step 5: Compare population change between cities

In this step, use the skills that you learned to study the population trends in another state and city, and compare them with trends in Las Vegas.

Make sure that USA Population Change 2000-2010 is the only layer displayed.

Open the attribute table for the Recent Population Change By State sublayer.

If necessary, show all columns again.

Scroll through the table and highlight a state of your choice to explore.

According to the table, did this state experience population increase or decrease from 2000-2010?
Was the loss or gain great, moderate, or slight?

Use the Options button to center on your selected state, adjusting the zoom level to view counties, if necessary.

What is the pattern of population change in the state at the county level?
Compare the pattern with the basemap. How do the population changes relate to major cities? Major highways?
Rural areas?

Zoom in to a major city in the state.
What is the pattern of population change at the tract level?

View pop-up windows for some of the tracts.
How do the rates of population change here compare with the rates of change you observed in Las Vegas?

Turn on the USA Projected Growth 2012-2017 layer.
Is the trend of the last decade expected to continue through 2017?
When you are finished, turn off the USA Projected Growth 2012-2017 layer.

Close the table.

If you will be continuing to the next exercise, keep your browser window open; otherwise, close it.

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**Step 6: Put it into practice**

How could you use the maps, procedures, or instructional strategy exemplified in the exercise with your own students?