

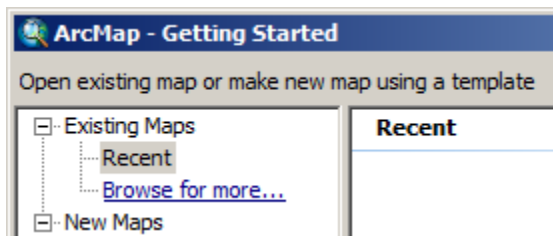
Module 4, Lesson 2

Growing pains

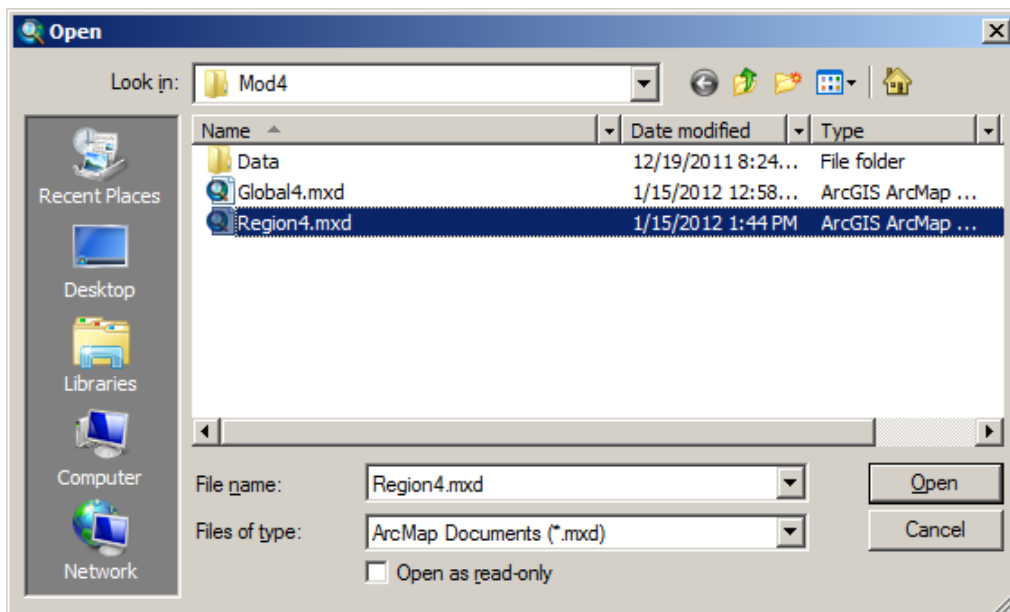
In this activity, you will analyze natural population growth for different countries. You will focus on Africa, one of the fastest growing regions in the world, and Europe, the slowest growing region in the world. You will analyze the standard-of-living indicators for each region and form a hypothesis about the relationship between these indicators and population growth.

Step 1: Open a map document

1. Double-click the ArcMap icon on your computer's desktop.
2. When the ArcMap start-up dialog box appears, click Browse for more...

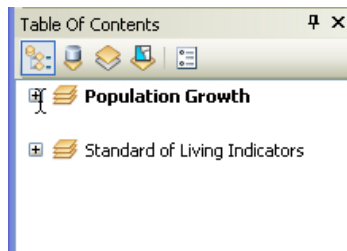


3. Navigate to the Module 4 folder (**OurWorld2\Mod4**) and choose **Region4.mxd** (or **Region4**) from the list.



4. Click Open.

- When the map document opens, click the plus sign next to Population Growth to expand the data frame legend in the Table of Contents.



You see a world map with two layers turned on (Countries and Ocean). The check mark next to a layer name tells you the layer is turned on and visible on the map. Two layers, Birth Rate and Death Rate, are listed in the Table of Contents but are not turned on.

Step 2: Compare birth rate and death rate data

The world's population is growing because there are more births than deaths each year. This fact can be expressed as a simple formula:

$$\text{Birth rate} - \text{Death rate} = \text{Natural increase}$$

$$(\text{BR} - \text{DR} = \text{NI})$$

You will now compare birth rates and death rates around the world to see if you can identify the regions that are growing fastest and slowest.

World Vital Events

World Vital Events Per Time Unit:2011

Time Unit	Births	Deaths	Natural Increase
Year	134,189,210	55,670,570	78,518,640
Month	11,182,434	4,639,214	6,543,220
Day	367,642	152,522	215,120
Minute	255	106	149
Second	4.3	1.8	2.5

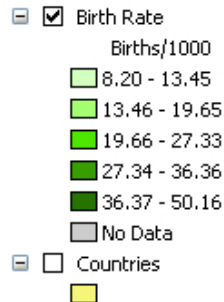
Figures may not add to totals due to rounding.

Source: [U.S. Census Bureau, International Data Base](#).

[Notes on the estimates](#)

This table from the U.S. Census Bureau shows the number of births, number of deaths, and rate of natural increase for the world population per year, month, day, hour, and second for 2007.

1. Click the box to the left of the Countries layer in the Table of Contents to turn the layer off.
2. Click the box next to Birth Rate to turn on the layer. This layer shows the number of births for every one thousand people in a country.



Answers to questions in this activity should be recorded on the answer sheet.

Q1 Which world region or regions have the highest birth rates?

Q2 Which world region or regions have the lowest birth rates?

3. Turn on the Death Rate layer by clicking the box to the left of its name.

Q3 Which world region or regions have the highest death rates?

Q4 Which world region or regions have the lowest death rates?

4. Turn the Death Rate layer off and on to compare the two sets of data.

Q5 If the overall rate of growth is based on the formula $BR - DR = NI$, which world regions do you think are growing the fastest?

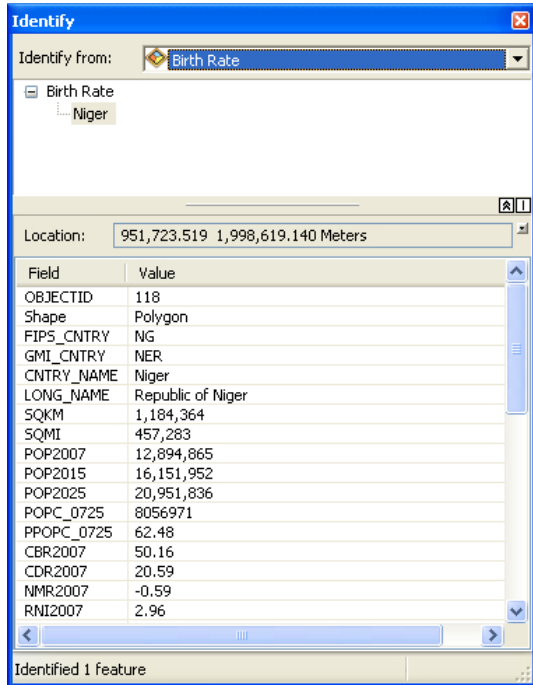
Q6 Which world regions do you think are growing the slowest?

5. Turn off the Death Rate layer.



6. You can use the Identify tool to learn more about the birth and death rates of specific countries. Click the Identify tool.
7. Move your cursor over an African country where the birth rate is very high. Click the country.

8. Move the Identify window so you can see the map (click the window's title bar and drag the window to the desired location).
9. Choose Birth Rate from the Layers list in the Identify window. Your Identify window should look similar to the one below:



10. Scroll down the list.

This layer contains a lot of information about each country. As you scroll down the list, you see attribute field names in one column and attribute values in another. The birth rate field is abbreviated as CBR2007 (crude birth rate in 2007), and the death rate field is abbreviated as CDR2007 (crude death rate in 2007). In the example above, Niger has a birth rate of 50.16 births per 1,000 living people and a death rate of 20.59 deaths per 1,000 living people.

11. Close the Identify window.



12. Click the Zoom In tool and draw a box around Africa and Europe.

Q7 Choose two European countries and two African countries and record their birth and death rates in the table on the answer sheet. Use the Identify tool, as described previously, to find information on your chosen countries.

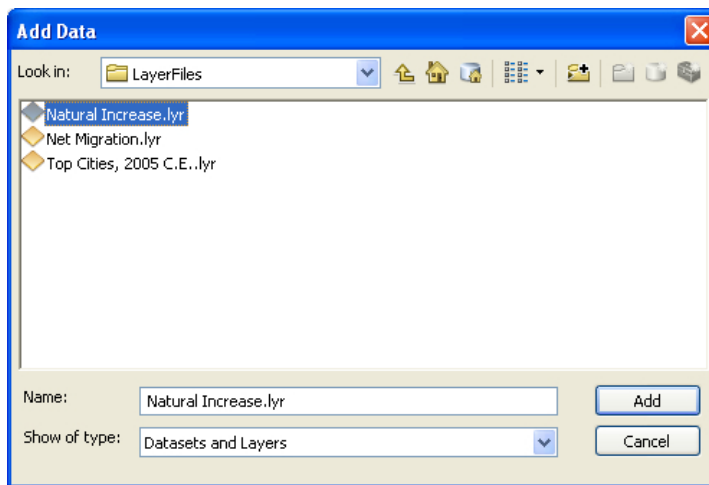
Q8 List three questions that the Birth Rate and Death Rate maps raise in your mind.

Step 3: Add the Natural Increase layer

You can test your predictions of the fastest and slowest growing regions (Q5 and Q6) by adding the Natural Increase layer to your map. This layer shows the yearly increase in population that result from the difference between births and deaths in each country.



1. Click the Add Data button.
2. Navigate to the LayerFiles folder within the module 4 Data folder (**OurWorld2\Mod4\Data\LayerFiles**). Select **Natural Increase.lyr** from the list and click Add.



3. Click the Full Extent button to return to the view of the entire world (if your map looks incomplete, click the Refresh View button below the map).

Similarly to the birth and death rates, the natural increase rate is expressed as a specific number of people per 1,000. This means that all the countries colored dark blue on the map add between 24 and 36 people to their populations each year for every 1,000 people already there.

The actual growth rate of an individual country is based on its natural increase plus the net migration of people into or out of that country each year.

Q9 *What is happening to the populations of countries that are pink?*

Q10 *Which world regions are growing the fastest?*

Q11 *Which world regions are losing people or not growing?*

Q12 *Think about what it would mean for a country to have a population that is growing rapidly or one that is growing slowly or shrinking. Which of these two situations do you think would cause more problems within the country? List some of the problems you would expect to see.*



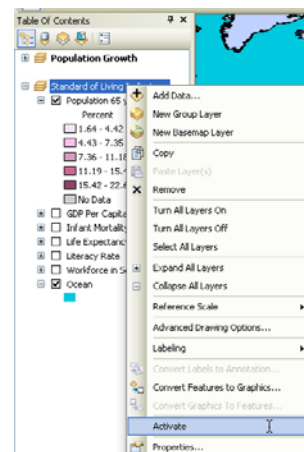
4. Click the Go Back To Previous Extent button to return the view to Africa and Europe.

Step 4: Look at standard-of-living indicators for Europe and Africa

Geographers look at certain key statistics when they want to compare the standards of living in different countries. They refer to these statistics as “indicators” because they typically reveal or provide some information about the quality of life in that country. The indicators that you will look at in this activity are the following:

- Population 65 years old and over (percent of the total population)
- GDP per capita (annual gross domestic product divided by total population)
- Infant mortality rate (annual number of deaths of infants under one year of age per 1,000 live births)
- Life expectancy (number of years a newborn infant would live if prevailing conditions of mortality at the time of birth continue)
- Literacy rate (percentage of the population over 15 years of age that can read and write; this definition varies slightly between countries)
- Services (percentage of the workforce that is employed in the service sector)

1. Click the minus sign next to Population Growth in the Table of Contents to collapse the data frame legend.
2. Click the plus sign next to Standard of Living Indicators to expand this data frame legend.
3. Right-click the Standard of Living Indicators data frame name and choose Activate.
4. Click Bookmarks on the Main menu, and click Europe and Africa.



The Standard of Living Indicators map is focused on Europe and Africa. Europe is one of the slowest growing regions and sub-Saharan Africa is one of the fastest growing regions in the world.

5. Look down the Table of Contents to see the six standard-of-living indicator layers. The first indicator, Population 65 years or older, shows the percentage of each country's population that is 65 years of age or older.

Q13 *Explore each of the six standard-of-living indicators and complete the table on the answer sheet.*

Keep in mind the following points:

- A layer will cover the one beneath it when it is turned on. You will need to turn layers on and off to see all the indicators.
- You can change the order of the layers by dragging them to a new position in the Table of Contents.
- You can expand or collapse the layers in the Table of Contents to show or hide the legends as you examine different layers.

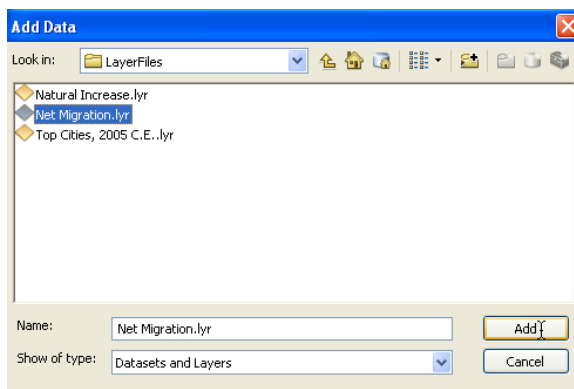
Step 5: Add the Net Migration layer

The net rate of migration is a statistic that indicates the number of people per 1,000 gained or lost each year as a result of migration. A negative number indicates that more people are leaving the country than coming in. A positive number means more people are coming to the country than leaving it.

Q14 *In Q13 you compared standard-of-living indicators for Europe and sub-Saharan Africa. Based on your observations of those indicators, which region would you expect to have a negative net migration? A positive net migration? Explain your answers.*



1. Click the Add Data button.
2. Navigate to the LayerFiles folder (**OurWorld2\Mod4\Data**) and add **Net Migration.lyr**.



Q15 *Summarize the overall patterns of net migration in Europe and sub-Saharan Africa in the table on the answer sheet.*

Q16 *What political or social conditions or events could explain any of the migration patterns you see on the map?*

Step 6: Draw conclusions



1. Click the Layout View button at the bottom of the map area to switch from Data View to Layout View.

The two data frames are displayed side by side on a layout so you can easily compare the two maps.

2. The Layout toolbar automatically becomes active. If your Layout toolbar is floating, dock it above the map.



3. Expand the Population Growth data frame in the Table of Contents to display its legend.



4. Enlarge your ArcMap window so that it fills your screen. Click the Zoom Whole Page button on the Layout toolbar.
5. Next, you will be comparing the Natural Increase and Net Migration layers. Make sure that both these layers are visible (not hidden beneath other layers) and that their legends are visible in the Table of Contents.

You may want to click the minus sign in front of the other layers to collapse their legends. This way the only visible legends will be the two that you are working with.



6. Click the Zoom In or Zoom Out tool on the Tools toolbar and zoom as needed to focus both maps on Europe and Africa once again (if you accidentally use the Zoom In or Zoom Out tool from the Layout toolbar, click the Zoom Whole Page button).
7. Look at the two maps and compare the rates of natural increase of some countries to their rates of net migration. Think about what correlation, if any, may exist between a country's standard of living, its rate of natural increase, and its rate of net migration.

Q17 *Based on your map investigations, write a hypothesis about how a country's rate of natural increase affects its standard of living and its net rate of migration.*

Q18 *In the table on the answer sheet, illustrate your hypothesis with data from one European country and one sub-Saharan African country. Use the Identify tool to see the data for an individual country.*

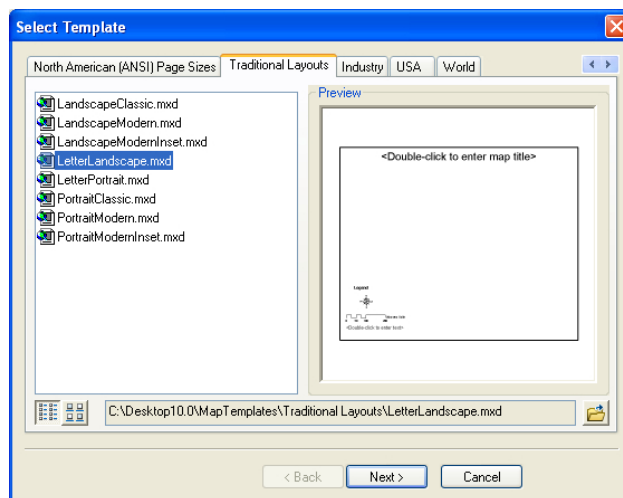
Indicator/Layer	Attribute field
Percentage of population 65 years or older	PPOP_65P
GDP per capita	GDP_PCAP
Infant mortality rate	IMR2007
Life expectancy	LE2007
Literacy rate	LITR_2007
Percent workforce in service sector	PGDP_SV

8. Close the Identify window.

Step 7: Design a layout

You will make some changes to the layout's design before you print it. You will use a template to add a title, legend, and other map elements.

1. Turn off all of the layers in the Population Growth data frame **except** Natural Increase and Ocean.
2. Click the Change Layout button.
3. Click the Traditional Layouts tab in the Select Template dialog box. If your window looks different from the picture below, click the List button in the lower left corner. Select **LetterLandscape.mxd** in the list.



4. Click Next. Make sure the Population Growth data frame is number 1 in the list (if not, click Move Down or Move Up) and click Finish.

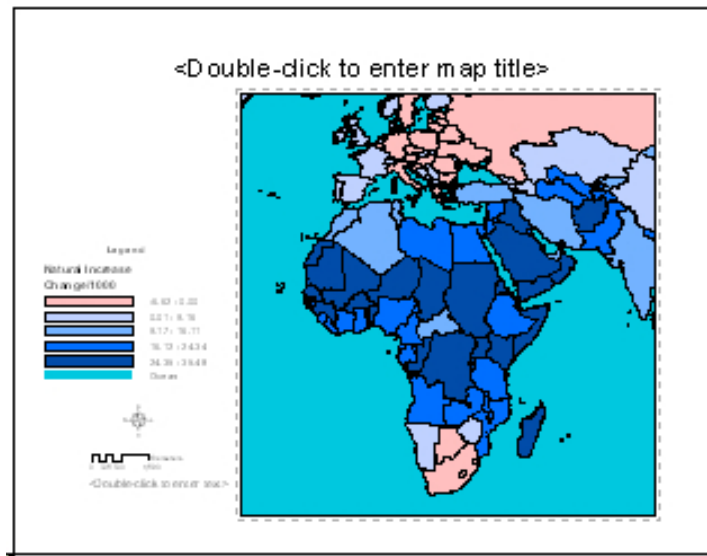
The Population Growth data frame fills the layout. You see text marking the place for a title, a legend, a North arrow, a scale bar, and another place for text.

Notice that the Standard of Living Indicators data frame has not been deleted—it has been moved off the layout. You can see part of it in the lower left corner of the layout view.

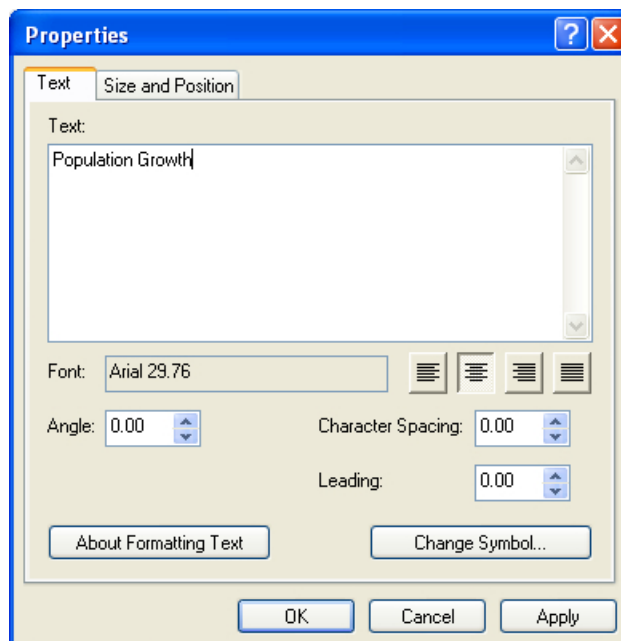


5. Click the Select Elements tool if it is not already selected. Click the map to display the blue squares at the border of the data frame.

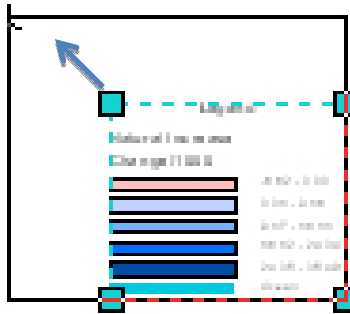
6. Place your cursor over the top middle blue square. When it changes to a double-headed arrow, click and drag the top of the data frame down below the title.
7. Repeat the procedure to drag the left side of the data frame over to the right of the legend and other map elements.



8. Double-click the text that reads <Double-click to enter map title>. Delete the text in the Properties dialog box and type Population Growth. Click OK.



- Click anywhere on the legend. Click one of the blue corner squares and drag it to make the legend larger.



- Place your cursor in the middle of the legend. Click the legend and hold the mouse button down. Drag the legend up to a suitable location closer to the top of the map.
- Double-click the compass rose that's below the legend to open the North Arrow Properties dialog box.
- Click the North Arrow Style button. Choose a different north arrow that you like from the North Arrow Selector. Click OK in both of the dialog boxes to apply your change.

The new north arrow displays automatically in the layout.

- Resize the north arrow using the blue squares.
- Double-click the scale bar to see its properties. Click the Scale and Units tab.

Q19 *What are the units of measurement?*

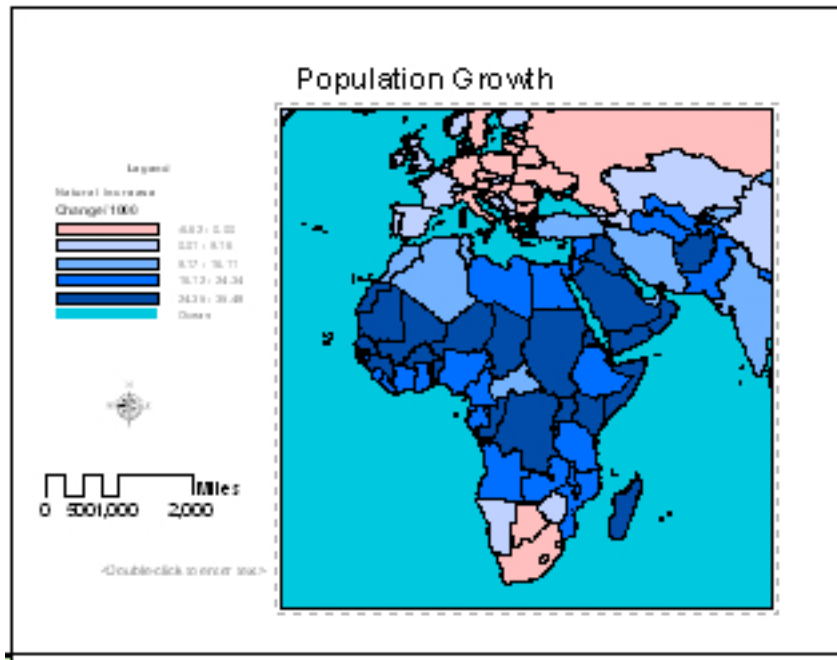
By default, ArcMap assigns the units of measurement and intervals based on the coordinate system of the data frame.

- Click the Division Units drop-down menu and select Miles. Click OK to update the scale bar's units of measurement.
- Enlarge the scale bar slightly so that it is easier to read.

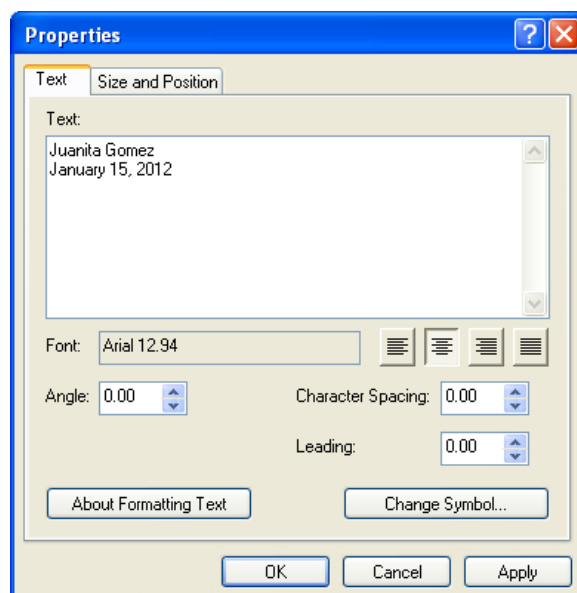
Step 8: Label your map and print it

When making maps, it's important to include the cartographer's name and the date the map was created. In order to make room for that below the scale bar, you may need to move the north arrow and scale bar up slightly.

1. Adjust the position of the north arrow and scale bar. Click and drag each one to the desired position so that they are centered beneath the legend in the white space to the left of the map.



2. To add the name of the cartographer (that's you!) and date, double-click the text below the scale bar.
3. In the text Properties dialog box, type your name. Press Enter to move to the next line and then type today's date. Click OK.



4. Click and drag the text box to the bottom right of the legend area. Then click any blank area on the layout to clear the box around the text element.

Your layout of Population Growth is now ready to print. If you need to make any final adjustments to your map, make them now. Otherwise, proceed to the next step.

5. From the File menu, click Print. Click the Setup button.
6. Use the following settings in the Page and Print Setup dialog box:
 - Under Printer Setup, click in the Name box to choose the printer you want to use.
 - Under Paper, set the paper size to Letter and the orientation to Landscape.
 - Under Map Page Size, check the box to Use Printer Paper Settings.
7. Click OK on both the Page and Print Setup window and the Print window. Your map should print after a few moments.

Step 9: Save your map document

You will be changing the layout. If you want to save your work on this layout, for example to print it or modify it at a later time, you need to save a copy of the map document in its current state.

1. If you wish to save the map document at this point, click the File menu and choose Save As. Ask your teacher for instructions on where to save this map document. Name it ABC_PopGrowth, where your initials are ABC. For example, John F. Kennedy would have named this map, JFK_PopGrowth.
2. Choose Save As again and save another copy of the map document for continuing your work on the next layout. Name this copy ABC_StdLiving, where your initials are ABC. For example, John F. Kennedy would have named this map, JFK_StdLiving.

Step 10: Make a map based on standard-of-living indicators and print it

1. Turn off all layers in the Standard of Living Indicators data frame except Net Migration and Ocean.
2. Click the Change Layout button. Make sure the LetterLandscape.mxt template is selected, and click Next.
3. Click Standard of Living Indicators and then click the Move Up button to move the data frame to the number 1 position. Click Finish. The data frames switch positions in the layout.

4. Follow the procedures you used for your Population Growth map above to now design a Standard of Living presentation map and print it.
5. If you already saved this map document after printing the Population Growth layout, click the Save button to save your work on the second layout. Otherwise, ask your teacher for instructions on where to save this map document and on how to rename it.
6. If you are not going to save the map document, exit ArcMap by choosing Exit from the File menu. When asked if you want to save changes to the map document, click No.

In this lesson, you explored world population growth and analyzed standard-of living indicators in one of the fastest growing regions of the world (sub-Saharan Africa) and the slowest growing region (Europe). You added layers and worked in two data frames. You created a layout for each data frame and printed your maps.