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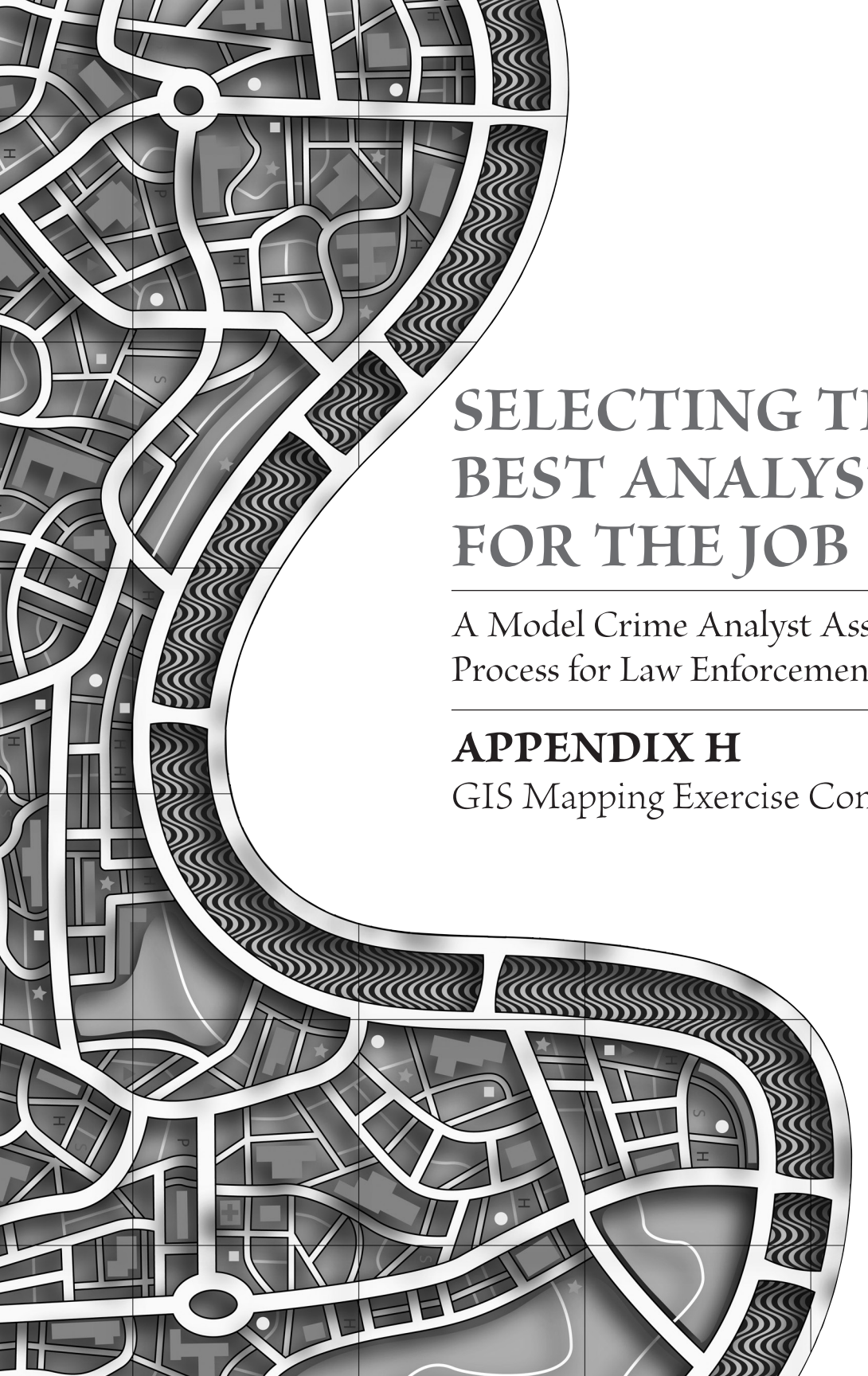
Canada



SELECTING THE BEST ANALYST FOR THE JOB

A Model Crime Analyst Assessment Process for Law Enforcement Agencies

APPENDIX H

GIS Mapping Exercise Components

Appendix H: GIS Mapping Exercise Components

H.1 GIS Mapping Exercise Instructions

This is an exercise to assess your basic mapping skills using ArcGIS 9. You will have 40 minutes to complete this exercise. We encourage you to apply your own creativity and to utilize any additional features that can enhance your final products.

Start-Up Directions:

a. Open ArcMap from Start Menu.
b. Click "OK" to open with "A new empty map".
c. Click on the Add button (plus sign with yellow background), click on drop down arrow and select to C:/, ESRIDATA, and USA.
d. Select shift and use the mouse to click on the following shapefiles: counties, rivers, roads (the 1st one), and states.
e. Under File select Save Project As. Go to C:/CMPAL Applicant Folder and save the project exercise under your name (e.g., Mike Smith.mxd).

Part 1

a. Select out the State of Kentucky and its counties and create two new layers: 1) Kentucky and 2) Kentucky Counties.
b. Create a new layer that contains only counties with an African-American population greater than 5,000. Label the new theme AA_Pop>5000.
c. Change the color of the Kentucky Counties to beige.
d. Change the color of the AA_Pop>5000 layer to green.
e. Label the counties that meet the criteria you selected in Part 1.
f. Print out the completed exercise using the Layout function and title the map "Kentucky Counties with an African-American Population Greater than 5,000".
g. Export the map and save under your designated folder as Part 1_Map.

Part 2

a. Make a bar chart showing the population changes from 1990 and 1999 for the counties that were identified in Part 1.
b. Label the title of the chart "Change in Population from 1990 to 1999". Also, add the following footer "These are counties with an African-American Population > 5000". Print out the completed exercise.

Part 3

a. Make a graduated color map based on the 1999 county population figures for Hispanics in Kentucky using a natural breaks classification with six classes.
b. Label the title of the map "Map of Hispanic Population in Kentucky by County for 1999" and print out the completed exercise.

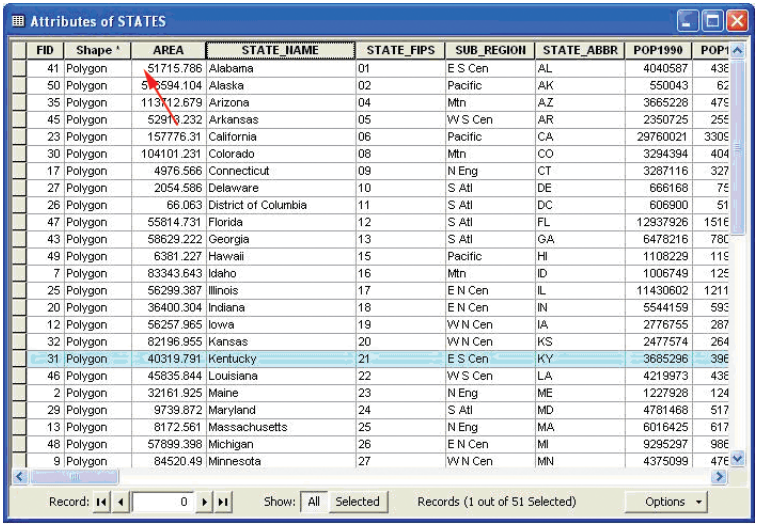
H.2 Administrator's Guide for GIS Mapping Exercise

PART 1

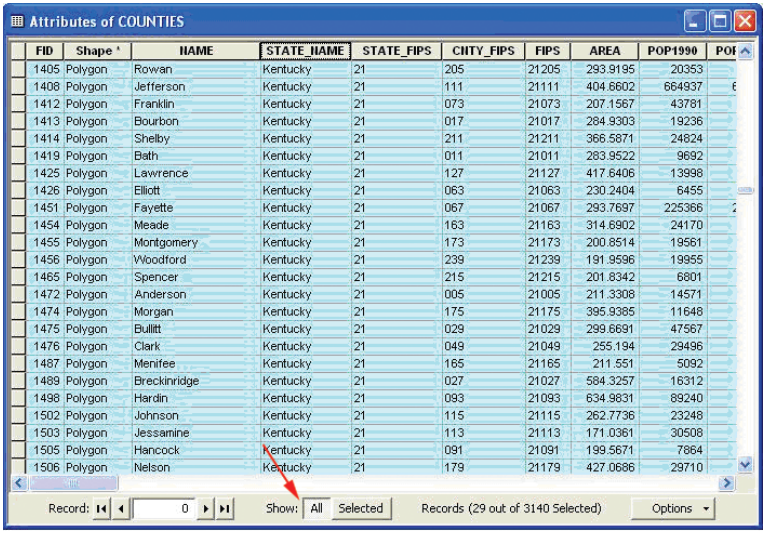
a. Select out the State of Kentucky and its counties and create the following layers: 1. Kentucky and 2. Kentucky Counties.
b. Create a new layer that contains only counties with an African-American population greater than 5,000. Label the new theme AA_Pop>5,000.
c. Change the color of the Kentucky Counties to beige.
d. Change the color of the AA_Pop>5,000 layer to green.
e. Label the counties that meet the criteria you selected in Part 1.
f. Print out the completed exercise using the Layout function and title the map "Kentucky Counties with an African-American Population Greater than 5,000".
g. Export and save the map (click on the File menu) using the (.jpg) extension in your designated folder under the name Part 1_Map.

What the candidate should have done:

1. To perform Part I, first select out Kentucky from the STATES layer by right clicking on STATES and selecting Open Attribute Table. Sort the STATES table by right clicking on the STATE_NAME field and selecting Sort Ascending. Select Kentucky and then exit out of the table. Right click on the STATES layer, then click on Selection, and select Create Layer From Selected Features. A new layer will appear. Rename the layer Kentucky by double clicking on the layer name. Type in the new name in the Layer Name box under the General tab.

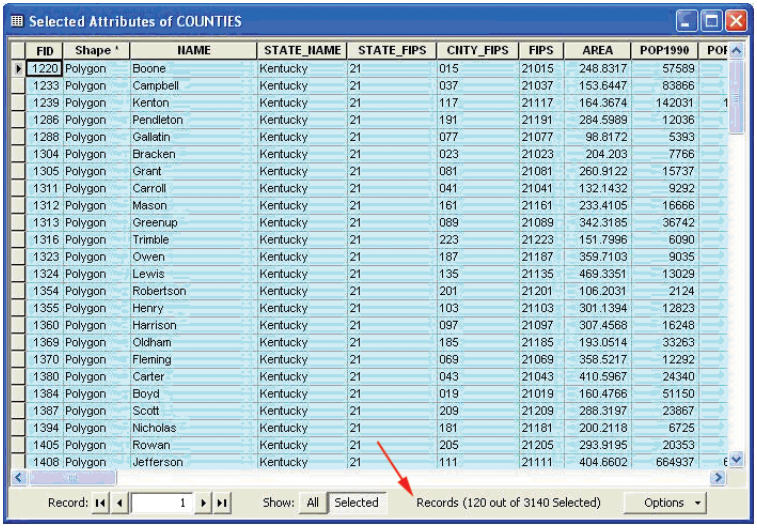


Next, select out the counties of Kentucky by right clicking on the COUNTIES layer and selecting Open Attribute Table. Sort the STATES table by right clicking on the STATE_NAME field and selecting Sort Ascending. Scroll down and highlight all the Kentucky counties and then click on the Selected button at the bottom.



FID	Shape *	NAME	STATE_NAME	STATE_FIPS	CNTY_FIPS	FIPS	AREA	POP1990	POI
1405	Polygon	Rowan	Kentucky	21	205	21205	293.9195	20353	
1408	Polygon	Jefferson	Kentucky	21	111	21111	404.6602	664937	6
1412	Polygon	Franklin	Kentucky	21	073	21073	207.1567	43781	
1413	Polygon	Bourbon	Kentucky	21	017	21017	284.9303	19236	
1414	Polygon	Shelby	Kentucky	21	211	21211	366.5871	24824	
1419	Polygon	Bath	Kentucky	21	011	21011	283.9522	9692	
1425	Polygon	Lawrence	Kentucky	21	127	21127	417.6406	13998	
1426	Polygon	Elliott	Kentucky	21	063	21063	230.2404	6455	
1451	Polygon	Fayette	Kentucky	21	067	21067	293.7697	225366	2
1454	Polygon	Meade	Kentucky	21	163	21163	314.6902	24170	
1455	Polygon	Montgomery	Kentucky	21	173	21173	200.8514	19561	
1456	Polygon	Woodford	Kentucky	21	239	21239	191.9596	19955	
1465	Polygon	Spencer	Kentucky	21	215	21215	201.8342	6801	
1472	Polygon	Anderson	Kentucky	21	005	21005	211.3308	14571	
1474	Polygon	Morgan	Kentucky	21	175	21175	395.9385	11648	
1475	Polygon	Bullitt	Kentucky	21	029	21029	299.6691	47567	
1476	Polygon	Clark	Kentucky	21	049	21049	255.194	29496	
1487	Polygon	Menifee	Kentucky	21	165	21165	211.551	5092	
1489	Polygon	Breckinridge	Kentucky	21	027	21027	584.3257	16312	
1498	Polygon	Hardin	Kentucky	21	093	21093	634.9831	89240	
1502	Polygon	Johnson	Kentucky	21	115	21115	262.7736	23248	
1503	Polygon	Jessamine	Kentucky	21	113	21113	171.0361	30508	
1505	Polygon	Hancock	Kentucky	21	091	21091	199.5671	7864	
1506	Polygon	Nelson	Kentucky	21	179	21179	427.0686	29710	

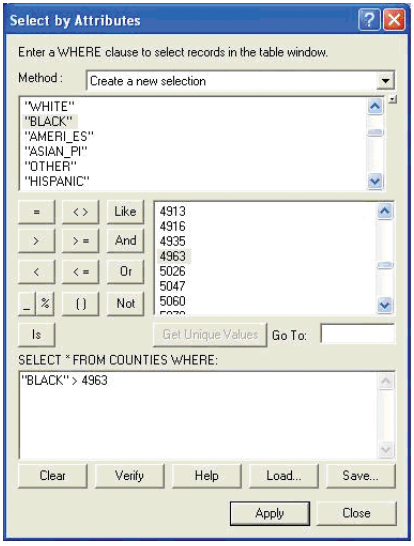
This will create a new selection box that includes only the selected Kentucky counties.



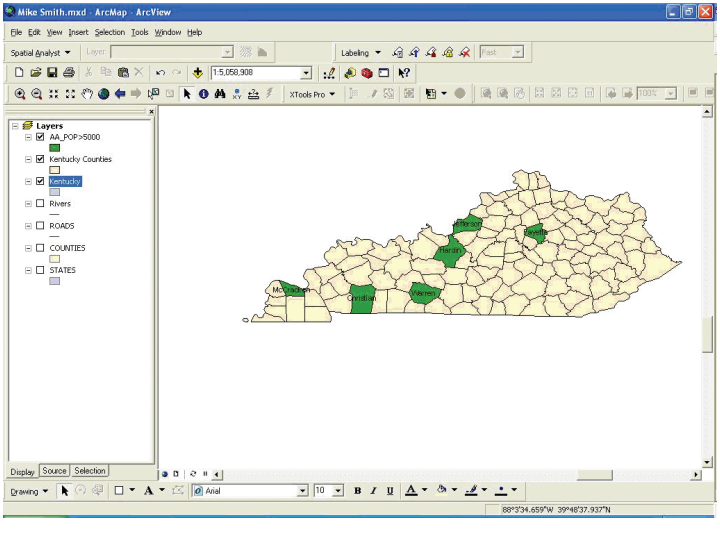
FID	Shape *	NAME	STATE_NAME	STATE_FIPS	CNTY_FIPS	FIPS	AREA	POP1990	POI
1220	Polygon	Boone	Kentucky	21	015	21015	248.8317	57589	
1233	Polygon	Campbell	Kentucky	21	037	21037	153.6447	83866	
1239	Polygon	Kenton	Kentucky	21	117	21117	164.3674	142031	1
1286	Polygon	Pendleton	Kentucky	21	191	21191	284.5989	12036	
1288	Polygon	Gallatin	Kentucky	21	077	21077	98.8172	5393	
1304	Polygon	Bracken	Kentucky	21	023	21023	204.203	7766	
1305	Polygon	Grant	Kentucky	21	081	21081	260.9122	15737	
1311	Polygon	Carroll	Kentucky	21	041	21041	132.1432	9292	
1312	Polygon	Mason	Kentucky	21	161	21161	233.4105	16666	
1313	Polygon	Greenup	Kentucky	21	089	21089	342.3185	36742	
1316	Polygon	Trimble	Kentucky	21	223	21223	151.7996	6090	
1323	Polygon	Owen	Kentucky	21	187	21187	359.7103	9035	
1324	Polygon	Lewis	Kentucky	21	135	21135	469.3351	13029	
1354	Polygon	Robertson	Kentucky	21	201	21201	106.2031	2124	
1355	Polygon	Henry	Kentucky	21	103	21103	301.1394	12823	
1360	Polygon	Harrison	Kentucky	21	097	21097	307.4568	16248	
1369	Polygon	Oldham	Kentucky	21	185	21185	193.0514	33263	
1370	Polygon	Fleming	Kentucky	21	069	21069	358.5217	12292	
1380	Polygon	Carter	Kentucky	21	043	21043	410.5967	24340	
1384	Polygon	Boyd	Kentucky	21	019	21019	160.4766	51150	
1387	Polygon	Scott	Kentucky	21	209	21209	288.3197	23867	
1394	Polygon	Nicholas	Kentucky	21	181	21181	200.2118	6725	
1405	Polygon	Rowan	Kentucky	21	205	21205	293.9195	20353	
1408	Polygon	Jefferson	Kentucky	21	111	21111	404.6602	664937	6

Exit the table and right click on the COUNTIES layer, click on Selection, and then select Create Layer From Selected Features. A new layer will appear. Rename the layer Kentucky Counties by double clicking on the layer name. Type in the new name in the Layer Name box under the General tab.

2. Using the Kentucky Counties layer, select Open Theme Table, click on Options, and then choose Select By Attribute. Double click on "BLACK" (the most current figure) and double click on the greater sign (>). Hit the Get Unique Values button. Double click on 4,963 which is the closest number to 5,000.



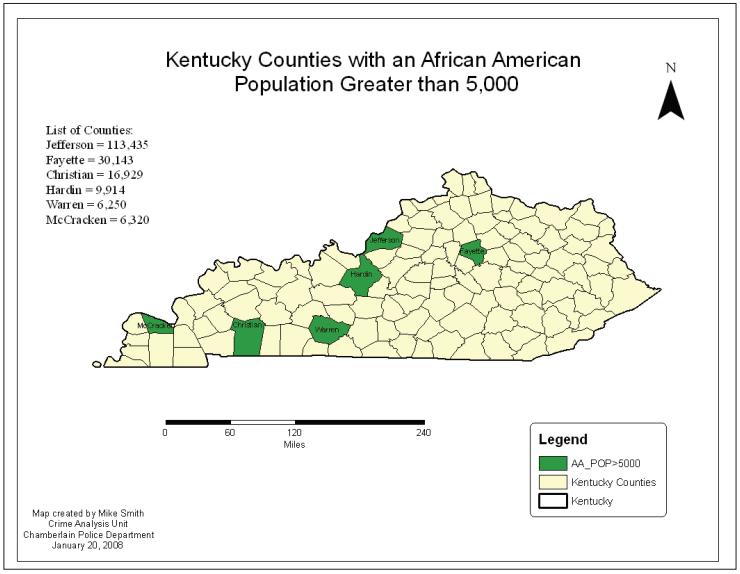
Click on the Apply button the query will run and highlight all the counties with a population of African-Americans more than 5,000. Click on the Selected button at the bottom. Exit out of the table and then create a new layer as instructed in previous steps. Label the new layer AA_POP>5,000.



The six counties that result from this query are the following: Jefferson, Fayette, Hardin, McCracken, Warren, and Christian. To label the counties right click on the AA_POP>5,000 layer and select Label Features.

To change the color of any layer or theme simply double click on the color symbol and select a new color.

3. Before printing out the competed exercise, the candidate must create the final map using the layout that can be found under the View option. In the layout view, the candidate has the freedom to create a map based on the instructions provided. The map should include the following standard map elements: legend, north arrow, scale bar, and a title (see example below). Additional items may be included at the applicant's discretion (e.g., shading, background color, personal touches). Before printing, we recommend that the test monitor remind the candidate to export and save their map in the designated candidate folder. To export the map, click on the File Menu and select Export Map. Make sure that Save As type box shows the JPEG extension (.jpg). If not, click on the drop down arrow box and select the corresponding extension. After the file is saved, print the map.



Key considerations to use when scoring this exercise include:

- Clarity of map
- Proper legend that includes the correct symbology and labels (i.e., counties, population, and state)
- Compass and scale
- Map title
- Additional map enhancements (e.g., background colors, list of counties that fit query criteria and population figures, date and time stamp, name stamp).

Part 2

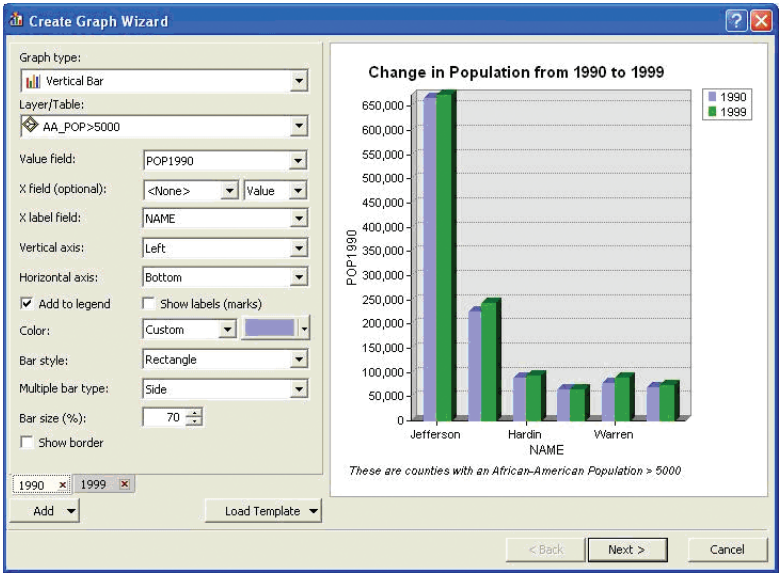
a. Make a bar chart showing the population changes from 1990 and 1999 for only the counties that were identified in Part 1.

b. Label the title of the chart "Change in Population from 1990 to 1999". Also, add the following footer "These are counties with an African-American Population > 5,000". Print out the completed exercise.

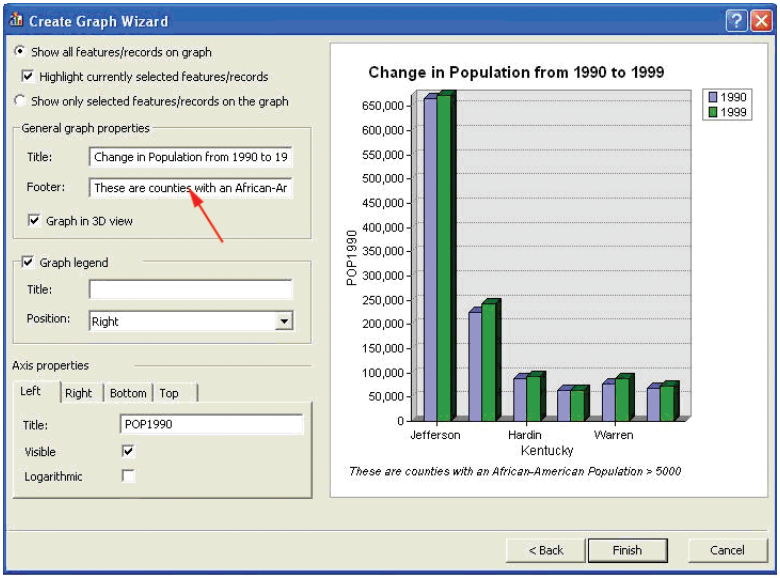
c. Export (by right clicking on chart) and save the chart as a JPEG in your designated folder under the name Part 2_Bar Chart. Print out the completed exercise (right click on chart to print chart only).

To perform Part 2, right click on the AA_POP>5,000 layer. Open the attribute table for Fayette County and click on the Options tab. Select Create Graph. Select the following options in the Graph Wizard:

Layer/Table: AA_POP>5,000
Value field: POP 1990
X field (optional): None/Value
X label field: Name
Vertical Axis: Left
Horizontal Axis: Bottom
Add to Legend: (check box)
Show Labels: (leave unchecked)
Color: Custom (select desired color)
Bar Style: Rectangle
Multiple Bar Type: Side
Bar Size: 70



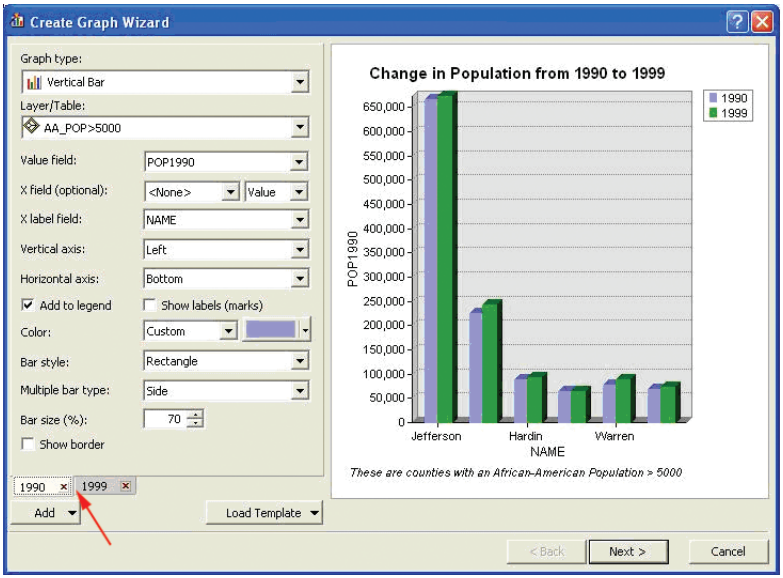
Then click Next and type the following in the Title box under General Graph Properties: Change in Population from 1990 to 1999. In the Footer box type: These are counties with an African-American Population > 5000.



To add the year into the legend, double click on the word near the bottom that says "Vertical Bar" right above the Add button (see image below). Rename the label 1990.

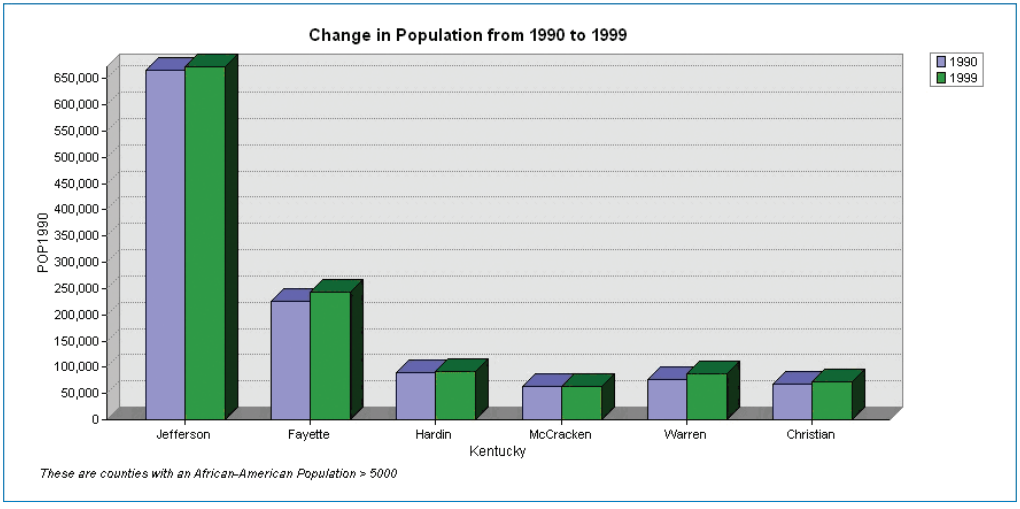
(Optional) Under Axis properties select bottom and type in Kentucky for state name or uncheck the visible option which will remove the 0 under the bar graph.

After you finish these entries, click on the Add button on the lower left of the Create Graph Wizard and select New Series. This will create a new screen where you will select the POP1999 for the Value field instead of 1990. The remaining options will be identical to those selected for 1990 except for the color selection which should be different to show the distinction between the 1990 and 1999 population.



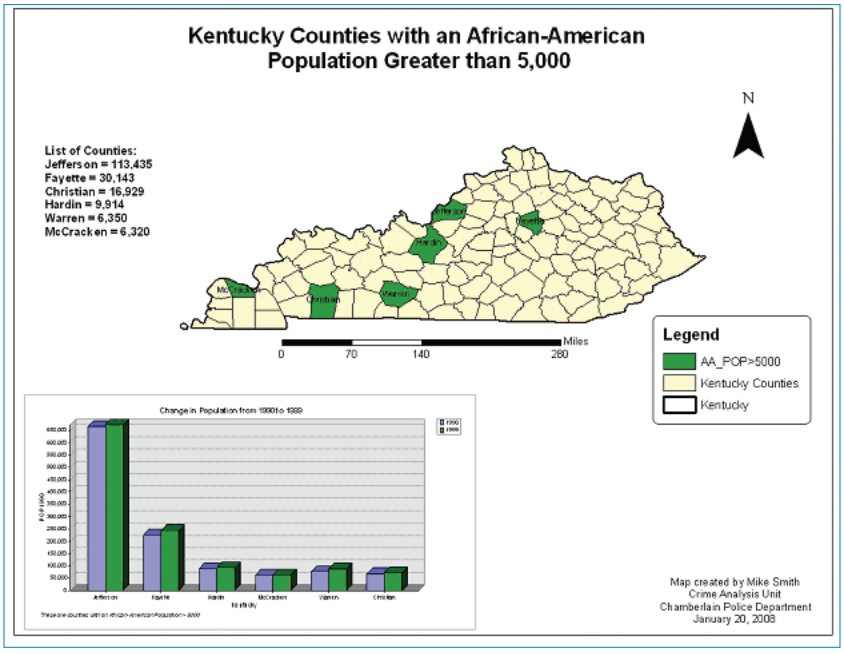
To enhance the chart, click on the Show border option towards the bottom of the graph wizard and under General Graph Properties check the graph in 3-D view box.

The result should look similar to the following:



Depending on the candidates' knowledge of GIS functions, they may be inclined to add the graph to the map layout as shown below.

To export the map, right click on the chart and select Export. Next, save as JPEG and then save the file under the name Part 2_Bar Chart. To print the chart right click on the chart again and then hit print.



Key considerations when scoring this exercise include:

- Clarity of the graph
- Proper legend that includes the correct labels for counties and corresponding years
- Chart title
- Additional chart enhancements (e.g., shading, use of colors, additional labels, etc.)
- Advanced GIS knowledge–ability to add graph into previous map.

Part 3

a. Make a graduated color map based on the 1999 county population figures for Hispanics in Kentucky using a natural breaks classification with six classes.

b. Label the title as follows: "Map of Hispanic Population in Kentucky by County for 1999", and print out the completed exercise.

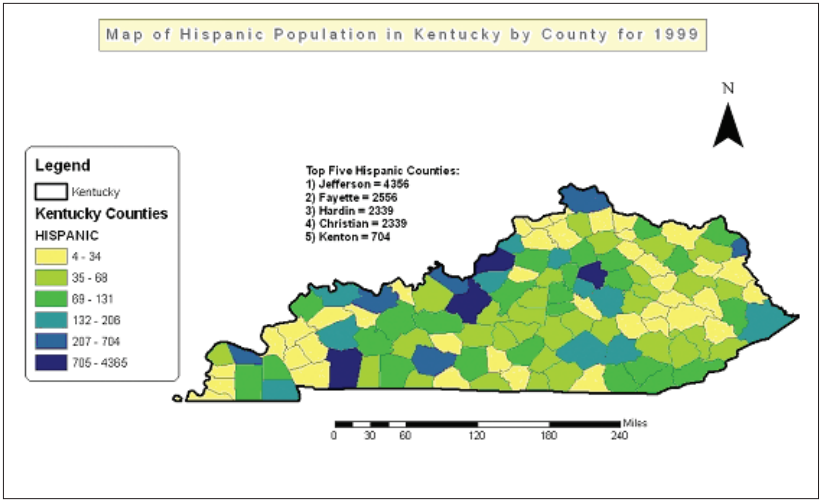
c. Export and save the map using the (.jpg) extension in your designated folder under the name Part 3_HispMap.

The candidate has the option to either create a new view in ArcGIS 9 based on the work that has already been done up to this point or to add another data view and continue working. If choosing the latter option, go to the Insert Option on the menu bar and click on Data Frame. A new data frame will appear. To add previous layers already in use, right click on the layer that you want to use for the new map and click on copy (to add more than one use the shift button). Right click on the New Data Frame and click on Paste Layer(s).

In this example, the two layers that should be added are the Kentucky state layer and the Kentucky counties layer. Once these layers are added, double click on the Kentucky counties layer and select the Symbology tab. Go to Quantities and Graduated colors under the Show box to the right of the menu box. In the Value box, select Hispanic. Natural breaks should be the default selection; if not, click on the Classify button and select the natural breaks classification. Next to the classes option, select six. Click Apply.

Click on layout view and add finishing touches to the map, including the standard map elements: legend, scale, compass, title, and name. Export and save the map in the designated candidate folder. Print Map.

The final map should similar to the one below:



Key considerations when scoring this exercise include:

- Clarity of map
- Proper legend that includes the natural breaks classification and corresponding labels based on population
- Compass and scale
- Map title
- Additional map enhancements (e.g., shading, use of colors, incorporation of surrounding states, list of counties with highest Hispanic population, date and time stamp, name stamp).

H.3 GIS Mapping Exercise Scoring Key

	Possible	Earned
A. Map of Kentucky Counties with African-American Population of More Than 5,000		
1. Clarity and organization of map elements	5	_____
2. Color of Kentucky counties changed to beige	7.5	_____
3. Labeling of six counties meeting criteria	10	_____
4. Color of six counties changed to green	7.5	_____
5. Legend with proper labels	10	_____
6. Title	10	_____
7. Scale	10	_____
8. Compass	5	_____
9. Personal additions (e.g., shading, borders, name/date, etc.)	5	_____
Total Possible = 70 points	**Total Earned**	_____

	Possible	Earned
B. Bar Graph of Population Changes in 1990 and 1999		
1. Correct title	5	_____
2. Correct footer	5	_____
3. Legend with correct labels	5	_____
4. Correct X and Y scales/labels	5	_____
5. Correct counties included in graph	5	_____
6. Personal additions (e.g., 3-D view, borders, etc.)	5	_____
Total Possible = 30 points	**Total Earned**	_____

	Possible	Earned
C. Map of Hispanic Population in Kentucky by County		
1. Clarity and organization of map elements	5	_____
1. Legend with correct labels	10	_____
2. Natural breaks classification	10	_____
3. Title	10	_____
4. Scale	5	_____
5. Compass	5	_____
6. Personal Additions (e.g., list of counties, name/date, etc.)	5	_____
Total Possible = 50 points	**Total Earned**	_____

Total Score = _____ out of 150 Percentage Score = _____

By: _____ (initial here)