

Your Name: _____

Lesson: Using US Bureau of Census Data to Site an Internet Café

Skills Involved:

- 1) Downloading, formatting, and understanding Census TIGER spatial data and demographic data.
- 2) Creating layouts.
- 3) Tabular and spatial sort and query.
- 4) Joining tables.
- 5) Overlay and proximity analysis.
- 6) Solving a problem based on spatial analysis.

Problem: You are a new franchisee for the company InstantWorld, which seeks to open an Internet Café in the City and County of Denver. Demographic analysis that the parent company conducted showed that its Internet Cafes do best in the following neighborhoods:

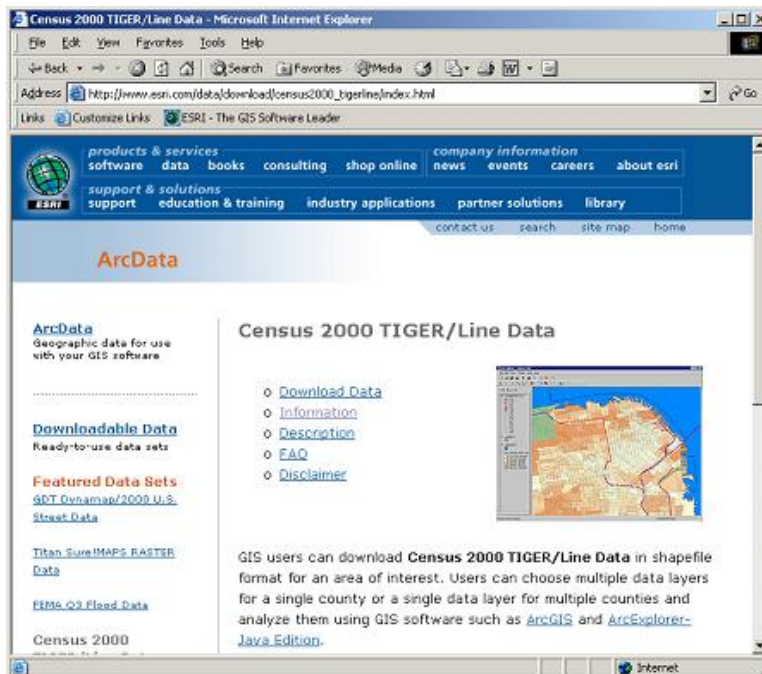
- (1) In a neighborhood where the percent of 18 to 21 year olds is over 10% of the total population of the neighborhood.
- (2) Within 1 kilometer of a high school, university, or college.
- (3) On a busy street (with a CFCC2 code of A1, A2, or A3).

Data Management

Create a folder on your computer or on the network where you will store the data. Make sure this folder has a name that is logical so that you will understand what its contents are, and without spaces to avoid problems in ArcGIS.

Go to the following web site to download the data:

http://www.esri.com/data/download/census2000_tigerline/index.html



Click on “Download Data” on the left side, and on the next screen, select Colorado on the map or on the list.

On the next screen, select Denver County and press “Submit.” Do not select any layers yet.

On the next screen, click the following 3 boxes, and then press “proceed to download” at the bottom of the list:

- Block Groups – 2000
- Landmark Features – Points
- Landmark Features - Polygons
- Line Features – Roads
- Census Block Group 2000 Demographics (Under “statewide layers”).

Select “Proceed to Download.” Next, you will receive a notice that your data file is ready:



Click Download File to save your data to the folder you created at the beginning of this lab.

Unzip the file with Winzip. Note that there will be many files that are zipped underneath this zip file. In other words, the file you downloaded is a zip of zip files. These are named similar to the following:

tgr08031grp00.zip
tgr08031lkA.zip
tgr08031lpy.zip
tgr08031lpt.zip
readme.html
sf1grp08000.zip

The FIPS code for Colorado is 08.

1) What do you surmise the FIPS code for Denver County to be?
Be sure to Unzip each of the files and extract. When you are finished, you will have 8 files:

tgr08000sf1grp.dbf
tgr08031grp00.dbf
tgr08031grp00.shp
tgr08031grp00.shx
tgr08031lkA.dbf
tgr08031lkA.shp
tgr08031lkA.shx
readme.html

The Census Bureau collects data for statistical areas and political areas. Political areas include Indian Reservations, cities, counties, and states. Statistical areas include Census Tracts, Block Groups, and Blocks. Blocks in a city or town are usually the same as a typical city block, bounded on all sides by streets. Blocks in a rural area may be much larger in area, and may be bounded by roads, streams, or a railroad. Groups of blocks are called Block Groups. Groups of Block Groups are called Census Tracts. Census Tracts nest within counties.

Block groups are analogous to neighborhoods; they are the smallest statistical area for which the more detailed Census data is available. You have just downloaded the Block Groups for Denver County.

Read the table that is embedded in the file called readme.html to answer the following questions.

2) In what year was the data collected?

3) Indicate the file containing each of the following features:

The roads:

The block group boundaries:

The Census demographic data on population and housing for the Block Groups:

The landmark points:

The landmark polygons:

Start ArcMap with a blank map document.

Add all of the layers (shape files) you downloaded earlier to your data frame: Roads, block group boundaries, landmark points, and landmark polygons. Rename the appropriate layers to "roads", "block group boundaries", "landmark points," and "landmark polygons" as appropriate, so that the file names are more intuitive.

Name your data frame "Denver County." Save your map document with a logical name, such as "Internetcafesites", and place it into the appropriate folder.

4) What are your map units? What is the coordinate system of your spatial data?

Set your display units to kilometers.

Your data sets are now ready for use in analysis.

5) Make a unique value map for roads, symbolizing the roads based on the attribute cfcc2 (Census Feature Class Code 2). Be sure to "add all values" to see all the possible values for cfcc2. Zoom in on the map when you are done, using the "I" identify button to answer the following: What is the CFCC2 code for the 3 most road types in Denver City

and County that you would say are the three major arterial types; i.e. that carry the most traffic?

6) What other information is in the roads table?

Using the Add Data tool, add the table containing your Census data on housing and population for Block Groups (the dbf file). Open this table and examine the data.

7) How many records; i.e., block groups, exist in this table?

Open the table for the Block Groups polygons for Denver City and County.

8) How many records exist in this table; i.e. how many block groups exist in Denver City and County?

9) What geographic extent do you think the longer table covers?

10) What is the name of the common field that these two tables share?

Clear any selected records in both tables.

11) Join the tables so you can map the demographic data for Denver County block groups. Refer to ArcGIS Help if you need to. Explain your procedures:

Using Data→ Export Data, export your joined data to a permanent data file named DenverCountyBlockGroups.

Save your ArcMap document.

Problem: You are a new franchisee for the company InstantWorld, which seeks to open an Internet Café in the City and County of Denver. Demographic analysis that the parent company conducted showed that its Internet Cafes do best in the following neighborhoods:

- (1) In a neighborhood where the percent of 18 to 21 year olds is over 10% of the total population of the neighborhood.
- (2) Within 1 km of a high school, university, or college.
- (3) On a busy street (with a CFCC2 code of A1, A2, or A3).

For your new DenverCountyBlockGroups layer, symbolize it as a graduated color thematic map of population 18 to 21 years old.

12) Describe the resulting pattern of raw numbers of 18 to 21 year olds by block group in Denver.

Next, symbolize the block groups as a graduated color thematic map of population 18 to 21 years old normalized by the 2000 population of the block group.

13) What does normalizing the data do?

14) Describe the resulting geographic pattern of *percentage of 18 to 21 year olds* by block group in Denver.

It will be much easier to solve your problem if you create a field that contains the actual percentage of 18 to 21 year olds by block group. Therefore, you will need to add a field and calculate the value of the new field that represents the percentage 18 to 21 year olds in each block group. Name the new field p1821, make it a float (floating point) data type, and give it a precision (width) of 5 and a scale (number of decimal places) of 2.

15) Explain how you accomplished the above task. ** See note below.

** Note: You will probably receive a VBA overflow error. Cancel the calculation and examine the table at the row where the percentage vacant field stopped calculating.

16) Can you determine why the calculation stopped working at this point? If so, state why.

17) Can you determine how to select certain records in the table so this problem will not occur again? If so, recalculate and state how you solved the VBA overflow problem.

18) Make a thematic map of your new field p1821. Indicate in which part of Denver the highest percentage of 18 to 21 year olds are found, and indicate the streets that bound these block groups.

Next, make a pie chart map with the 2 parts of each pie representing the following: percentage of 18 to 21 year olds, and total population in each block group. Experiment with the size and the overlap functions.

19) Describe your pie chart map.

20) Next, make a dot density map of the raw numbers of 18 to 21 year olds. Describe the result.

21) In your opinion, which of the maps—graduated color, pie chart, or dot map—is the easiest to understand for mapping this type of variable at a county-wide scale, and why?

22) How many block groups exist with 10% or more of their population between 18 and 21 years of age?

23) What expression did you use to obtain the above results?

24) Describe the spatial pattern of these Block Groups.

Save your map document again.

You have determined 1 of the 3 criterion needed to site your InstantWorld franchise.

Next, you need to find out where the high schools are located. Examine the table for your **point** landmark feature.

25) What CFCC indicates if a point landmark feature is a school?

Select the schools in the point landmark feature layer.

Access ArcToolbox.



Use Analysis Tools → Proximity → Buffer to create 1 kilometer buffers around the selected features (schools).

Next, you need to find out where the high schools are located. Examine the table for your **polygon** landmark feature.

26) What CFCC indicates if a polygon landmark feature is a college or university?

As you did for the high schools, create 1 km buffers for the colleges and universities.

You now have 2 of the required 3 criteria for locating your business and have picked up some valuable skills about using and manipulating spatial data along the way.

Use the Analysis Tools → Overlay → Intersect function to intersect the high schools, colleges and universities, and block groups containing at least 10% 18 to 21 year olds. Name your resulting layer `hs_univ_p1821` or something else that is suitable.

27) How many polygons are under consideration?

28) Near which 2 universities are the areas now under consideration?

It might be helpful for you to set a spatial bookmark at each of these locations.

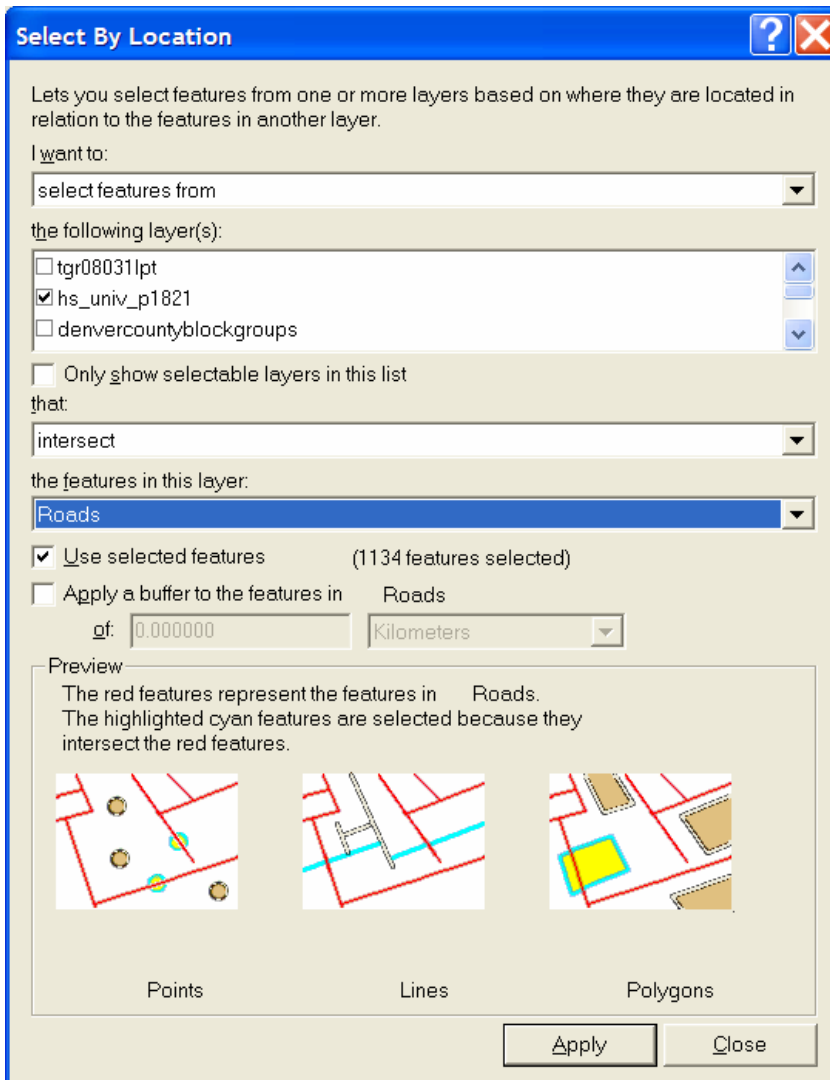
29) Why aren't any areas near the Auraria Campus (University of Colorado-Denver / Metropolitan State University / Community College of Denver) under consideration for *InstantWorld*?

Recall that the final criterion is on a busy street, with a CFCC2 code of A1, A2, or A3.

30) What expression did you use to select these streets?

31) How many street segments meet this criterion?

Use the Select → Select By Location function to intersect your `hs_univ_p1821` layer with the busy streets, as follows:



32) Describe your result and indicate how many polygons exist in the hs_univ_p1821 layer.

Export these polygons into a data set named "internetcafesites" or something else that is suitable.

33) Why couldn't you have used another Overlay → Intersect operation to achieve the above results instead of the select by location function?

Now that you have narrowed your selection to just a few neighborhoods, you note that there is one neighborhood where the median age (med_age) is the lowest of the neighborhoods under consideration. Select the polygons comprising the neighborhoods where the median age is lowest and zoom to these polygons.

- 34) Name the streets where the proposed *InstantWorld* location will be and the university it is near.
- 35) How far is this neighborhood from the Geography Building (Boettcher West) at the University of Denver?
- 36) You used busy streets, median age, population 18 to 21 years old, and the location of colleges, universities, and high schools to determine the best location for your Internet Café. What other criteria would you need to make an even better decision to site this kind of business?
- 37) What data layers would you need to consider the criteria that you mentioned above?
- Save your map document.
- 38) Create a layout containing your final neighborhood under consideration along with the roads, road names, map title, a scale bar, your name, a legend. Export the layout as a graphic and insert the graphic into this Word Document.
- 39) Summarize in a few sentences what you have learned about spatial data from the US Census Bureau in this lesson.
- 40) Summarize in a few sentences what you have learned about GIS and about site selection in this lesson.